SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA

FINAL REPORT

TO:

REGIONAL MEDICAL PROGRAMS SERVICE
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
CONTRACT NUMBER - HMS 110-70-349

VOLUME I
PROJECT SUMMARY

HEALTH SYSTEMS RESEARCH CENTER
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA

HEALTH SYSTEMS DEPARTMENT
WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PENNSYLVANIA

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SYSTEMS ANALYSIS

OF MEDICAL RECORDS

IN GEORGIA

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This project was conducted under contract HSM 110-70-349
awarded by the Regional Medical Programs Service
of the Health Services and Mental Health Administration

VOLUME I

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Health Systems Research Center
Georgia Institute of Technology
Atlanta, Georgia

Health Systems Department
Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

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PREFACE

The present volume, Volume I of a three-volume final report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, contains a discussion of the project results. This volume, entitled PROJECT SUMMARY, is submitted in accordance with the provisions of United States Public Health Service contract HSM 110-70-349. Volume II contains a review of the state-of-the-art in medical records systems, and Volume III contains a description of four analytical methods which can be used to evaluate procedures for processing, entering, storing, and retrieving medical record information. The project was conducted jointly by the Health Systems Research Center of the Georgia Institute of Technology and the Health Systems Department of Westinghouse Electric Corporation for the Regional Medical Programs Service of the Health Services and Mental Health Administration in the period July 1970 through September 1971.

The objectives of the project were to describe the state-of-the-art in medical records systems and to develop analytical methods for studying and improving medical records systems in health-care facilities. During the course of the project, twelve hospitals, five nursing homes, and one neighborhood health clinic were studied by the project team.

At each facility, data on the management and flow of medical record information were collected by using one or more of the four methods developed in the project. The purposes of the data collection were: (1) to test and refine the methods and (2) to construct a profile of basic information regarding the use and maintenance of medical records systems. During the course of data collection and methods development, two proprietary computer programs of the Westinghouse Electric Corporation were employed; these programs were the Network Analysis Method and Work Sampling Method. Also, the method described in Chapter 3 of Volume III was based largely upon the Hospital Staffing Methodology for Medical Records, which was developed at the University of

Michigan. Data regarding the state-of-the-art in medical records systems was obtained via direct inquiry to manufacturers and users of these systems. An extensive bibliography of journal articles and project reports was also prepared. Neither an examination of the medical-decision-making aspects of the medical record nor an analysis of the quality of the medical information residing in the medical record were included in the project. While these topics are important, their consideration was beyond the scope of the project.

The successful completion of this project was due to the efforts of various individuals, institutions, and groups to whom credit is gratefully extended. Important contributions were made to the project by the following on behalf of the Health Systems Research Center: John W. Coyle, Gerald L. Delon, Chris C. Efland, Terrance M. Patrick, James F. Smith, Karenan P. Stubbs, and Gerald B. Widegren. Major contributions were made to the project by the following members of the Health Systems Department: Charles C. Camp, Edwin E. Keelen, Frank W. Koenig, and Stewart F. Paterson. The present volume was written by Mr. Coyle.

Appreciation is extended to Dr. J. Gordon Barrow and the staff of the Georgia Regional Medical Program for their advice and cooperation. Also, acknowledgement is given to the several consultants and members of the advisory board to the project for their valuable contributions and active interest.

In particular, sincere appreciation is extended to the many medical records librarians, administrators, nurses, physicians, and other personnel who so graciously and generously contributed their time and thoughts to the project. Their busy schedules were interrupted for extended periods of time, and the project could not have been completed without their assistance.

Harold E. Smalley, Director
Health Systems Research Center
Atlanta, Georgia
September 28, 1971

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CHAPTER I

INTRODUCTION

1.1 PURPOSE

The overall purpose of the project, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, was to conduct an analysis of patient medical record systems as currently established in a variety of health-care delivery settings, including hospitals, nursing homes, neighborhood health clinics, and private physicians' offices. The analysis was conducted with the long-term goal of developing the means of bringing medical record systems performance in line with medical and administrative information requirements.

1.2 OBJECTIVES AND SCOPE

The specific objectives of the project were (1) to develop analytical methods for studying and improving medical record systems in health-care-delivery facilities, and (2) to describe the state-of-the-art in medical record systems. The analytical methods were to be designed for application in systems analysis studies in which information would be collected on the operating characteristics of a facility's medical record system. Furthermore, the methods were to be straight-forward and not difficult to apply while, at the same time, yielding meaningful information, which would serve as the basis for modification of the system or for more thorough examination of some element of the system.

In achieving these objectives, the focus of the project was the management and flow of medical record information rather than the medical-decision-making aspects of the medical record or the quality of the medical information residing in the medical record. Specifically, the project was concerned with the personnel and procedures employed within the Medical Records Department of hospitals and also with the procedures for entering, storing, processing, and retrieving medical-record-related information in nursing homes, neighborhood health clinics and private physicians' offices, as well as in hospitals.

1.3 BACKGROUND

In health care delivery facilities such as hospitals, nursing homes, neighborhood health centers, and doctors' offices, the timely availability of desired information is fundamental to the delivery of the most beneficent medical care and to the efficient operation of the facilities. Recognizing the importance of the health facility's information system to the physician and to the facility's administrator, and also realizing that the current information systems are generally inadequate, prompted the Regional Medical Program Service (RMPS) in 1969 to seek means of bringing medical information systems performance in line with medical and administrative information requirements. Since the medical record is the basic vehicle for the storage and transfer of information in health care facilities, RMPS decided that improvements in the use and management of the medical record should be stressed initially. This decision subsequently led to the award of a contract (PHS Contract Number HSM 110-70-349) to the Health Systems Research Center of the Georgia Institute of Technology to perform a systems analysis of the medical record as used in a variety of health care facilities in Georgia.

1.4 METHOD OF PROCEDURE

The specific objectives of the project were approached in the major steps described below:

1. Selection or design of an analytical method appropriate to studying the management, use, and flow of medical record information.

2. Test the method through application in one or more health-care-delivery settings.

3. Evaluate the method in terms of difficulty of application and value of the results obtained from applying the method.

4. Revise, test, and evaluate the method until satisfied that the method provides the necessary information while requiring the expenditure of as few resources as necessary.

5. Collect data on advanced systems and concepts which are suitable for application to the management and flow of medical-record-related information.

1.4.1 Development of Analytical Methods

The development of methods for application in analytical studies of medical record systems consumed a major portion of the resources which were expended in the course of the project. It was decided that analytical methods should be developed for use in studies of (1) the Medical Records Department, per se, (2) the use of medical-record-related information, and (3) the flow of medical-record-related information.

Two methods which can be used in studies of the Medical Records Department of a hospital were adapted or developed in the course of the project. These methods were the Michigan staffing method and work sampling. The Michigan staffing method, a technique for determining the proper staffing level for a Medical Records Department, was adapted from the Hospital Staffing Methodology for Medical Records (1), which is a rather lengthy procedure for manually computing the staffing level. A computer program was written to make the Hospital Staffing Methodology for Medical Records easier to use, and procedures and forms for collecting the required data were designed. The method, referred to as the Michigan staffing method after the University of Michigan, where the Hospital Staffing Methodology for Medical Records was originally developed, was tested in several hospitals. Modifications to the method were made when inaccuracies or limitations of the method were discerned during the testing.

Work sampling, one of the traditional techniques of industrial engineering, was adapted to determine how the resources of the Medical Records Department are consumed in performing work activities in the department. A classification scheme of departmental work activities was devised and procedures and forms were developed for collecting the requisite data. This method was tested and refined in the course of using the method in several hospitals.

The third method developed in the project was designed to determine how the medical record is used on hospital nursing wards, in neighborhood health clinics, in doctors' offices, and other places where the medical record is used in recording or retrieving data. The method was developed to provide a means of determining who uses the medical record, for what purpose, for what period of time, and during which period of the day. Procedures and data collection forms were designed to collect the appropriate data, and a computer program was written to facilitate analysis of the data. The method, referred to as the observation technique, was used in several hospitals in order to test and refine the method.

The fourth method, which was developed in the project, was designed to collect data on the flow of medical-record-related information in health-care-delivery facilities. This technique, called communications network analysis, was originally based on the Network Analysis Method, a proprietary program of the Westinghouse Electric Corporation. The Network Analysis Method was found to be too cumbersome and time-consuming to be cost-effectively employed; consequently, this method was altered and refined during tests conducted in several hospitals and a neighborhood health clinic. Procedures and forms for data collection and analysis were designed for the communications network analysis method.

1.4.2 State-of-the-Art Review

Information on advanced systems and concepts which are being developed or applied to the management and flow of medical-record-related information was collected via direct inquiry to the developers and designers of the systems and concepts. Data was obtained from manufacturers of systems and components which are, or can be, used in recording, processing, storing, and retrieving medical information. Individual leaders in the development of automated medical information systems were identified and their major contributions and future plans were described. Information was also collected on current projects which are concerned with medical record systems, and an extensive bibliography on medical record systems was constructed.

LITERATURE CITED

(1) Bartscht, Karl G., Wayne H. Smith, Steven P. Gray, and William F. Howard, Hospital Staffing Methodology Manual MM-7 Medical Records, Hospital Systems Research Group, University of Michigan, January, 1968, 478 pp.

CHAPTER 2

DISCUSSION

2.1 PROJECT RESULTS

Four methods which can be used in analytical studies of medical record systems were developed in the course of the project, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA. The methods were developed for the use of hospital systems analysts, medical records librarians, administrators, and other individuals who are concerned with improving medical record systems and were designed for use in a variety of health-care-delivery settings including hospitals, neighborhood health clinics, nursing homes, and doctors' offices.

In addition, a review of state-of-the-art developments in medical record systems was conducted. Advanced concepts, systems, and equipment for medical records were identified and described, as well as medical record innovators and their current and planned projects.

Furthermore, in the course of testing, evaluating, and refining the analytical methods developed in the project, a considerable amount of information was collected in a number of health-care-delivery settings, particularly hospitals. Much of this information was too narrow in scope to report, as the data were essentially only of interest to the facility in which the data were obtained. Other data, however, were of general interest and consist of problems, suggestions, and trends obtained in interviews with hospital personnel. These latter data were assembled into a profile of basic information regarding the use and maintenance of medical record systems.

2.1.1 Analytical Methods

The four analytical methods developed in the course of the project were the Michigan staffing method and work sampling (applied to the Medical Records Department), the observation technique (for determining medical record utilization), and communications network analysis (for collecting data on the flow of medical-record-related information). Each method was designed to be relatively simple and inexpensive to apply. The methods were developed to be useful in the analytical studies which should be conducted prior to attempting to determine what modifications, if any, should be made in a facility's medical record system. Each technique and the procedure for applying it and interpreting its results has been described in detail in Volume III, METHODS MANUAL, of the report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA.

2.1.1.1 Michigan Staffing Method

The Michigan staffing method is a technique for determining the proper staffing level for the Medical Records Department for the conditions which exist within the hospital. The method, which is specifically designed for use in hospitals, can also be used to predict departmental staffing as conditions, systems, and procedures within the hospital change. The method, which is based on the use of pre-established standard times for the elements of each work operation performed in the Medical Records Department, computes the standard staff time required for each direct work category in the department. The computed standard staff times can then be used in a comparison with existing staff times devoted to each direct work category to determine whether the department is properly staffed. Or, as previously indicated, the medical records librarian can use the computed standard staff times to plan for changes in the department staff level as she anticipates changes in work-load or considers modifications to existing systems and procedures.

2.1.1.2 Work Sampling

Work sampling is a technique for determining how staff time is utilized in the Medical Records Department and the percentage of departmental staff time expended in accomplishing each of the various work activities. While the Michigan staffing method does not include indirect work categories, such as administration, special studies, and intra-departmental training, work sampling includes both direct and indirect work categories. Although work sampling studies can be performed to accomplish a variety of objectives, the specific work sampling procedure developed for this project is concerned with estimating the percentage of total departmental staff time devoted to each work activity with a prescribed confidence level and accuracy. The results, then, provide indications of those work activities which, percentage-wise, consume large amounts of total staff time; these work activities are those which should, logically, be examined first when the medical records librarian is contemplating changes in the systems and procedures within the department.

2.1.1.3 The Observation Technique

The direct observation technique is based on round-the-clock or eight-hour monitoring of medical record usage on a nursing ward in a hospital or in any other area where the medical record is used to record and retrieve medical information, such as a health clinic or doctor's office. The method provides results for a number of medical-record-usage parameters, including average utilization time per record, percentage of records pulled by type of user, frequency of records pulled by time of day, and so forth. In general, the method results in information on who uses the medical record, for what reason, at which time of day, and for what length of time. Analyses of the results may be used, for example, to determine the locations of input-output terminals if a computerized medical record system is being considered.

2.1.1.4 Communications Network Analysis

This method is an organized procedure for collecting the data necessary to characterize the flow of medical-record-related information in hospitals and other health-care-delivery facilities. In addition to quantifying communications flow parameters, the method yields narrative information on problems, suggestions, and trends related to the medical record system as perceived by the personnel who manage and interact with the system. The method uses an interview technique to acquire information on the flow of medical-record-related data and on the operation of the medical record system. The method, therefore, assumes that those who use and manage the medical record system are capable of providing numerical estimates with a fair degree of accuracy. This assumption is not particularly harmful, since the method includes a means of detecting inaccuracies in the collected data, and because the analysis of the method results is based on an order of magnitude comparison among the results. The analysis provides information on areas of high communications activity, the utilization of the various transportation modes which exist within the facility, and departments which can benefit from changes in the systems and procedures used in the preparation and transportation of departmental communications related to the medical record.

If desired, the communications network analysis method can be modified such that the numerical information is obtained via counting techniques, which require the tagging of paper communications and log-in/log-out procedures for all communications. While such modifications will result in more accurate data being collected, the added expense, in terms of time and manpower, make such modifications difficult to justify given the analysis performed on the data. Furthermore, some departments will maintain logbooks on many of their communications for legal, billing, or administrative reasons.

Narrative comments on problems and suggestions related to the Medical Record Department or the medical record itself frequently point to improvements which can be easily made and which cause only minor disruptions to existing systems and procedures. Section 2.1.3 contains a further discussion of problems, suggestions, and trends.

2.1.2 State-of-the-Art Review

A survey of the state-of-the-art in medical record systems was completed including the assembly of an extensive bibliography on medical records. The survey results have been documented in detail in Volume II, STATE OF THE ART REVIEW, of the report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA. Volume II contains sections on:

1. The general characteristics of manual, microfilm, and computerized medical record systems.

2. Advanced computerized systems for the maintenance and handling of medical records.

3. Major vendors of medical records systems and equipment.

4. Leading innovators in the development of automated medical record systems and concepts.

5. Current research and development projects which pertain to medical record systems.

6. The recent literature pertaining to medical records.

2.1.3 Data Analysis

The test, evaluation, and refinement of the four analytical techniques developed in the project generated a large amount of information pertinent to the operation of medical record systems in health-care-delivery facilities, in particular in hospitals but also in nursing homes, doctors' offices, and a neighborhood health clinic. Of all the data which were collected, the narrative comments regarding problems, suggestions, and trends related to the maintenance and use of medical record systems are of general interest, as well as being relevant to the individual hospital.

On the other hand, the numerical data, which were collected for the communications flow parameters, the utilization of the medical record on the nursing wards, and the distribution of work activities in the Medical Records Department, are misleading if aggregated. The reason for this is that the systems and procedures for managing and using medical-record-related information vary in the extreme from one hospital to another. Consequently, the available numerical data can not be used to construct a data profile which represents a "typical" set of characteristics for the management and use of a "typical" medical record system within a "typical" hospital. Considering the great variation which was found in the sample (twelve hospitals) of hospital medical record systems examined in the course of the project, it is unlikely that any reasonably sized sample would produce a meaningful data profile. This statement, however, should not be taken to mean that the collected data are meaningless for, as explained in Section 2.1.1, the data are useful in pointing out areas for possible improvement in the medical record system of the facility in which the data were collected.

The Appendix to this volume contains an extensive listing of problems, suggestions, and trends which were obtained in interviews while employing the communications network analysis method in twelve hospitals and one neighborhood health clinic. The comments are sorted and grouped according to a categorization scheme developed by the Health Systems Department, Westinghouse Electric Corporation. Problems, suggestions and trends are each categorized according to one of the following comment types:

1. Medical Record
2. Forms Design
3. Operational Procedures and Personnel (within departments)
4. Operational Procedures and Personnel (between departments)
5. Education/Training
6. Facility Design
7. Equipment
8. Other

Each of the above comment types is further broken down into a series of descriptors as shown in Table 2.1. The descriptors serve the purpose of further delineating the comments into categories. For example, a comment of Type 1 (Medical Record) modified by the descriptor, Record, is a comment on the entry (or recording) of information in the medical record. Such a

TABLE 2.1 Comment Types and Descriptors for Problems, Suggestions, and Trends.

Comment Type	Descriptor
Medical Record	Record (enter) Process Store Retrieve Transmit Distribute Utilize
Forms Design	Lengthen Shorten Change Content
Operational Procedures and Personnel (within departments) Operational Procedures and Personnel (between departments)	Time Direct Cost Information Morale Control Utilization Salary
Education/Training	Qualifications
Facility Design	Departmental Adjacencies Size Departmental Layout Building Location
Equipment	Design Cost Maintenance
Other	Can be used with any attribute

comment may appear in the listing of comments under problems, suggestions, or trends. One might expect that, of all the hospital departments, the Nursing Service would make the greater share of comments in this category. An inspection of the Appendix shows this to be true.

As a further example of interpreting the Appendix, a comment of Type 6 (Facility Design) modified by the descriptor, Departmental Adjacencies, is a comment on the proximity relationships between two departments. Such a comment may be a problem as on page A-17 of the Appendix, or a suggestion as on page A-28, or a trend, although a comment in this category does not appear in the Appendix under trends.

Notice that, within each category (defined by a comment type and descriptor) in the Appendix, the comments are grouped according to the department which was the source of the comment.

2.2 CONCLUSIONS

In this project, four methods were developed specifically for application in systems analysis studies of medical record systems in a variety of health-care-delivery facilities. These methods provide the hospital systems analyst, hospital administrator, and medical records librarian with the appropriate tools to conduct the initial analytical studies which should precede attempts to modify the systems and procedures used in entering, processing, storing, and retrieving medical-record-related information.

Also, the state-of-the-art in medical records systems was reviewed and documented with the intent of providing a source of information on advanced systems and concepts pertaining to the management and use of the medical record.

In the course of testing and refining the four analytical methods, a large amount of numerical data was collected on the management, use, and flow of medical record information. While it would seem possible to construct a profile of the management, use, and flow of medical record information from the data, the extreme diversity of operational procedures and personnel patterns employed in the medical record systems of the various facilities precluded the formation of such a profile. The numerical data, however, are useful in pointing out areas for possible improvement in the medical record system of the facility in which the data were collected.

The information which is of the most general interest is the narrative comments obtained in the application of the communications network analysis method. Some comments are encountered repeatedly because those problems, suggestions, and trends which are on the minds of the personnel in one facility are similarly on the mind of the personnel in other facilities. Some of these comments pertain to poor forms design, lack of standardization, illegibility of information, and the inability to get the medical staff to adhere to the procedures established for the use and control of medical records. Consequently, the comments in the Appendix to this volume are probably the best representation of a basic profile of information on the use and management of the medical record.

APPENDIX

Problems, Suggestions, and Trends Obtained as Comments in Interviews with Personnel in Twelve Hospitals and One Neighborhood Health Clinic Using the Communications Network Analysis Method.

PROBLEMS

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Record	Medical Record Dept.	Admissions does not give patients full name properly, making chart difficult to locate.
		Doctors are too often lax in entering medical information into medical record.
	Business Office	Progress notes do not always jibe with the supporting material in the medical record.
		Not enough clinical data in computer system because of small staff.
		Only 49 percent of encounter forms have disease coded by physician.
	Nursing	Doctors frequently forget to countersign students' orders.
		Variability between physicians is great as related to completness and legibility which affects MR quality.
		Nurse note dated on one sheet and continued to preceeding sheet requires a date which is sometimes left off.
		Seem to always be filling out drug requests, at least 50 requests each day. This is a 21 bed ward.
		A doctor is required to countersign his student's orders. The nurses have a hard time getting these signatures to complete the MR due to unavailability of doctor.
		Many old charts are misplaced or taken off by the doctor. Sometimes they are never found, no check-out system. When patient is discharged, Medical Record personnel are responsible for tracking down any lost MR's.
		Progress notes are generally incomplete.
		Problem with legibility of doctor progress notes.
		Nurses have trouble obtaining information on new patient from doctor.
		Nurses notes are inadequate.

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Record	Nursing	Nursing aides can chart in the MR. The supervisor feels that the quality of the information in the nursing notes suffers because the aides are not properly trained and do not always chart pertinent information. This is also true to a lesser extent of the other nursing staff.
		All forms generated are handwritten, including doctor's history, physical, notes, consultations - making them difficult to read, time consuming and hard to locate.
		Nurse seems to do a lot of unnecessary charting, writing nurses notes takes too much time.
		Nurses spend too much time transcribing - need another clerk.
	OR	Nurses notes are not complete or informative enough. Need more rationale and detail.
	Pharmacy	Terms used or abbreviations to denote drugs not legitimate abbreviations and pharmacist cannot always determine what is being ordered.
		Have been some errors in copying on the requests for data processing, but not enough to warrant getting rid of data processing.
		Drug request not always filled in completely. Have to be sent back to team to be completed.
		Pharmacist does not like "take as needed" on request. Doctor needs to be more specific.
		Doctors must sign separate prescription for narcotics, which wastes physician's time.
	X-Ray	No doctor ID on request from emergency room, thus cannot identify patient's doctor.
	Other	Encounter forms not being filled out correctly because they are filled out by several people.
		Many diagnoses are not being recorded on forms and there is much mis-copying on form.
		They have a problem getting the attending physician to fill out forms.

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Process	Medical Record Dept.	Doctors often take excessive time to finish discharge summary.
	Business Office	If Medical Record Dept. does not provide information in timely manner, then medicare claims cannot be submitted.
	Admissions	Data process has increased medical record size at admission.
	Nursing	History not available for several days because of dictation.
		Dictation of Doc history, physical and OP notes take several days.
		Nursing is responsible for sending down complete chart of discharged patient and arranging it in correct order, which is not her responsibility.
		Nurses' notes should be limited to important notes only.
		Since patients MR is sent back to MR Dept., lab results of tests are also sent to MR Dept. when tests are completed. These slips are frequently not put on the patient's chart so that outpatient has to track them down in the MR Dept. when the patient returns.
	OR Dept.	Sometimes when patient is dismissed the parts of his chart kept at his room are not placed with the rest of the chart and not sent to the MR Dept. The split chart in this hospital requires that the TPR and medication sheet, the I&D sheet, and the nurses notes be kept in a box hung outside the patient's door.
	Pharmacy	Mistakes made on ward in transcribing physician's order from chart to pharmacy request. Wrong drugs sent at least once a day.
	Other	Not enough control in past on the generation of patient numbers which caused a great duplication of patient folders.
Store	Medical Record Dept.	MR jackets sometimes get placed inside one another and are lost. One time 5 records were found inside one jacket.
		Information that is sent to MR to be stored in a check-out file is sometimes lost.

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Store	Medical Record Dept.	Anesthesia report not kept with rest of patient's medical record.
	Nursing	Storage of charts in different mobile baskets in four different categories makes it impossible to determine availability of charts and increases retrieval time.
		Because of nature of teaching facility and specialties of facilities, the patients require more acute care which results in larger medical records.
		The physical size of a medical record can be so great that it is difficult to keep it in the designated slot in the nursing station.
		Some charts get too thick and Ward secretary has to thin them.
	Other	Decentralization of the MR storage greatly decreases control.
Retrieve	Medical Record Dept.	Doctors notes are not legible and this hinders the processing of the medical records.
		Difficult to locate charts that are signed out to other team areas.
		Retrieve time is great when M.R. is not in Medical Record Dept.
	Nursing	Doctors won't use admission form for information. Insist on having old chart. This chart is stored across the street and sent to the MR Dept. then to the floor. The charts take a long time to get to the floor and many times are lost because of the routing through MR Dept.
		Problems with obtaining history and physical prior to surgery. Doctors bring them with them so that it is only accessible at the time of surgery rather than prior to. Often information is scanty and possibly several days old.
		Biggest problem is that the medical record is not available as often as needed because doctors have them out.

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Retrieve	Nursing	Takes too much time to figure out doctor's orders due to illegibility. Too much time to trace doctor to get orders interpreted.
		Doctor frequently takes patient charts to their offices making it totally unavailable on the nursing unit.
		Medical record almost never in chart rack at nursing station because doctors have them.
		Trouble retrieving MR promptly from MR Dept. Many medical records lost.
	OR Dept.	Old charts are frequently missing, sometimes because the doctor checks them out prior to patient admission.
	X-Ray	It takes 3 days to enter a name in rotary file. Patients who had an X-Ray within the past 3 days are not in the system and it is hard to determine if a previous X-Ray was taken.
	Pharmacy	Since pharmacy request is a single-copy form and hence a "traveling" form, it is not always available to those who need it.
	Other	With the medical records in five different locations, means four more places from which record can be lost.
Transmit	Medical Record Dept.	Any component of the medical record that is processed in the M.R. Dept. and sent to the floor is hand carried by personnel of the Medical Records Dept.
		There is all too often a significant lag time getting the medical record to the doctor.
		Occasionally parts of the medical record are misplaced but this is due to human errors which cannot be controlled.
	OR	Sometimes the MR. Dept. will put a requested chart on the dumbwaiter and not notify the floor. Thus, no one knows to pick it up.
Distribute	Medical Record Dept.	The Medical Records Dept. does not send any documents in the pneumatic tube system, although it could be used to save travel time.
		Documents are received from other departments only occasionally by the pneumatic tube.
		Multi-routes for the same information causes problems.

TYPE: Medical Records

DESCRIPTOR	SOURCE	COMMENT
Distribute	Other	The creation of a mental health record denies other teams of patient data and duplicates storage.
Utilize	Nursing	Everyone makes entries in medical records and every service generates its own form which creates some confusion.
		On admission a blank history form is placed in the chart. This is rarely used due to doctor's typed history being inserted.
		The student doctors monopolize the chart during the day making them generally unavailable.
		Doctor sometimes does not red flag charts to have orders transcribed.
		Too many people handle files and medical records cannot always be located.
		Kardex is used more than medical record by nurses and clerks on the nursing station, diminishing value of M.R.
		Lab results are often not up-to-date;either the staff did not put them on chart or lab did not send them back in time. Thus, as far as the OR is concerned, the chart is incomplete.
	Other	To insert information in chart RN must write her name and date on two cards, give them to clerk who gives her the record. Time consuming. RN tries to avoid checking out charts - therefore, many reports of borderline value are not put into chart.
		Random arrangement of the medical records wastes nurse and physician's time. This is primarily caused by lack of quality.
		Difficult to interpret medical record content for nutritional value because of many unrelated segments.

PROBLEMS

TYPE: Forms Design

DESCRIPTOR	SOURCE	COMMENT
Lengthen	Admissions	The newer forms have no room for charges in text.
		Adult questionnaire too lengthy. Takes about 40 minutes to get through one.
	X-Ray	Rotating file of patients number, name, birthdate, used in cross-reference for X-Ray jacket file doesn't have enough information and similar names are confused.
Shorten	Admissions	All the information recorded on the admission form isn't necessary.
	X-Ray	There is no need to have X-Ray request and X-Ray report form. Causes duplication of effort and bulk of paper.
Change Content	Business Office	Forms multicopy with carbon and imprint often does not come thru on business office copy because it is last copy.
		No standard insurance form for out-patient billing. Causes time loss and confusion.
	Admissions	Some of the abbreviations used on the pre-admitting form printed are not clear to patient. They do not understand what information is being requested.
		Many patients do not understand meaning of "third party agency" on insurance information card. Wrong (or no) information frequently supplied here by patient.
		People do not understand admission questionnaire contents.
	Nursing	Extra work to add patient sex, race, weight, blood pressure, medicare status to all EKG requests.
		The McBee edge punch card is used for all lab, X-Ray, pharmacy, and central supply requests without use of the edge punch feature.
		Maiden name of patient not on admission slip causes confusion.
	ER	Information on form is printed too small and is very detailed.

TYPE: Forms Design

DESCRIPTOR	SOURCE	COMMENT
Change Content	Other	Radiology form has no area for date.
		The laboratory data cannot be easily xeroxed from the medical record because leafed records hide data.
Other	Business Office	The charge cards are not being properly filled out on the nursing unit. Many omissions made.
		Forms design is not assigned to any department with no central coordinating agency. This is needed to reduce the number of forms and their effectiveness.
		Carbon imprint on BO copy of some multi-part forms does not always come through
		When state or federal or hospital insurance forms changed, there is not enough information on how to use new form. Changes are frequent and cause much confusion.
	Admissions	Admissions use the forms for medical records every day but were never consulted during the design of the form.
	Nursing	Nursing staff has no voice in the design of forms used by them.
	Laboratory	With present lab forms the third and fourth copies are difficult to read.
		Handwritten reports are difficult to read.
	X-Ray	The fifth copy of the X-Ray request cannot be read if the person does not write hard enough when initiating the request.
	ER	Sometimes information does not come through on last carbon copy. Doctors complain.

PROBLEMS

TYPE: Operational Procedures and Personnel (within department)

DESCRIPTOR	SOURCE	COMMENT
Time	Medical Record Dept.	When medicare was started, 75% of chief MRL was spent trying to meet requirements.
	Business Office	Is nonprofitable and time consuming to use collection agencies for uncollectible accounts, so does collection work herself. Takes up great deal of time, but results better.
		Does all charge posting by hand. No posting machine. Uses peg-board system which is time consuming. Would not be adequate system for larger facility.
	Nursing	Repeat of pharmacy request every three days creates unnecessary clerical work.
	Laboratory	Filing reports is a problem both in time and accuracy.
	X-Ray	Two typists are responsible for typing all X-Ray reports. If one is off, the typing and reports are delayed. This causes a backlog of one or two days for reports. These two clerks must type approximately 150 reports per day.
	Pharmacy	Receive requests sporadically and are notable to do best work because of peak loads.
	Other	Excessive delays in inserting lab and X-Ray results into medical records by team MR clerk.
Direct Cost	Business Office	Three people had to be hired just to complete forms required for Medicare-Medicaid.
		Medicare patients stay on an average of more than 60 days and Medicare will not pay any part of bill until patient is discharged. This causes a drain on hospital operating funds.
		With over 100 programs to maintain OP could use two additional programmers.
	Pharmacy	Unit dosage very efficient, but would be very costly for a large facility since pharmacy stations would have to be on every floor for optimum patient care.
		Are on formolary system and very inadequate. $30,000 in drugs pilfered last year because of loose control over drugs.

TYPE: Operational Procedures and Personnel (within department)

DESCRIPTOR	SOURCE	COMMENT
Information	Medical Record Dept.	Doctors offices call MR excessively to obtain information. As many as 50 calls per day have been received.
	Business Office	Medicare requires too much detail in billing data.
		Physicians are not coding diagnosis on the encounter form as required which make statistics invalid.
	Admissions	Doctors do not supply enough pre-admitting information so that admitting procedures can be simplified and faster. Patients have to wait to be admitted.
	Nursing	Don't have a method of checking off treatments on Kar-Dex. Would like to have some system of doing so.
	X-Ray	All secretarial work is processed by X-Ray technician.
		Doctors' handwriting is hard to interpret.
	ER	Doctor gets copy of emergency record on hit-and-miss basis.
	Pharmacy	Some of the prescriptions are lost when they arrive at pharmacy. There is no way of controlling these misplaced cards.
	Other	Family members unable to remember family number since head of household only had ID card.
		Duplicate copy of lab and X-Ray results are maintained by the team because of lack of confidence in medical records.
Morale	Medical Record Dept.	Med. Rec. Dept. is presently short on personnel. Turnover is a problem primarily due to low salaries.
	Business Office	All responsibilities rest on one person and others assume menial jobs. Too much work for one person.
	Nursing	Staff is family-like in its relations which can be a problem at times.
Control	Medical Record Dept.	House staff seems to be reluctant to adhere to strict MR procedures.

TYPE: Operational Procedures and Personnel (within department)

DESCRIPTOR	SOURCE	COMMENT
Control	Nursing	The decentralization of specialties makes it difficult to control beds and nursing services. They have three general surgeons, opthalmology, orthopedics,thoracic, neurology and oral surgery subspecialties.
		Seems to be too many doctors for each patient.
	Laboratory	A problem in getting the personnel requesting the X-Ray to complete the form properly.
Utilization	Medical Record Dept.	Turnover in personnel causes a considerable lag time in transcribing.
		Some clerical work has to be done by administration members such as voluminous Xerox copying and is costly and time consuming.
	Business Office	Because staff is not trained prior to hiring, there is some overstaffing and built-in inefficiency.
	Nursing	The use of the metal chart holder to store the addressograph plate makes it difficult to use when chart is away from the nursing station.
		Could use another clerk on nursing unit to do routine paperwork.
	X-Ray	The X-Ray request being processed by the recpt. is the biggest bottleneck in the department.
	ER	Have to fill out ER form on every patient in ER Room. Form detailed and time consuming.
	Other	Considerable amount of nutritional coordinators time is spent in clerical and routine communication tasks.
		Patients were not properly processed initially which caused duplication of patient numbers.
		Having to fill out an encounter form for every encounter made very time consuming.
Salary	Medical Record Dept.	Salaries as a whole are below average.
	Other	Medical Records in each time is unpaid in relation to the amount of work performed.

PROBLEMS

TYPE: Operation Procedures and Personnel (between Departments)

DESCRIPTOR	SOURCE	COMMENT
Time	Medical Record Dept.	If the Medical Records Dept. must transmit the complete jacket to another area within the hospital, it is sent by the internal mail service, which is slow.
	Business Office	Lag time between discharge and physician's final diagnosis. Insurance claim made on final diagnosis.
		Information needed as quickly as possible from MR Dept. so forms can be filled out in business office.
	Nursing	Too many punched cards to fill out. Punched cards are needed for nearly all requests, lab tests, drugs, X-Ray. When ordering multiple units of blood from the bloodbank, a blood request form - plus an IBM card - must be filled out for each unit requested. For some operations, such as open heart surgery, this procedure is particularly combersome.
		Stat request and blood sample are not promptly done in many cases.
	Laboratory	Lab request for stat procedures come after doctors' rounds. Procedures are requested to be performed within the hour and the lab doesn't receive the request until 40 to 50 minutes have elapsed.
Direct Cost	Nursing	Each chargable item is tagged with a charge which the user fills out and leaves at nurses station to be sent to billing. The doctors usually throw these away unused, thus the patient is not charged.
		Facility is operating at a loss.
Information	Medical Record Dept.	When a patient no longer occupies a bed the units assume they are discharged and send documents to Medical Rec. Dept. The patient may have been transferred to another unit and these documents are in the mail system where medical information cannot be utilized.
		Many patients come to the hospital without adequate documentation of previous medical history.
	Business Office	Need better communication with doctors to get final Rx report upon patient discharge. Poor communication between physician and business office.

TYPE: Operation Procedures and Personnel (between Departments)

DESCRIPTOR	SOURCE	COMMENT
Information	Business Office	Rapport between claims department and Medical Records critical. Breaks down with every change of MR Librarian.
		Cannot get information necessary to complete processing of patient bill from other departments in time to complete bill at patient discharge.
		No communication between DP and Med. Rec.
	Admissions	The admitting diagnose written by the doctor in the ER is not legible and cannot be transferred to the Admissions forms.
	Nursing	Many patients in this ward spend several days in the ICU following surgery before returning to the ward. Certain information is recorded on a different form in the ICU. For example, temp and blood pressure are recorded on one form in the ICU and on another form in Ward 3W. Results in discontinuity and records, which leads to difficulty in following patient history for a patient's stay in the hospital. Doctors in particular complain about this.
	OR	Pneumatic tube system could be improved.
	Laboratory	Nurses do not complete lab form with vital information which causes lab personnel to make extra trips to the units.
		If doctor's name is not signed on lab request from ER, the lab must send their personnel to find doctors or check records to identify the doctor who ordered the test.
		Receive innumerable calls each day from wards asking for results of tests which have been done but not yet inserted in record which peaks between 4:00 and 6:00 P. M.
	X-Ray	Data processing does its reporting too soon and monthly volumes not accurate.
		-Ray request shouldn't be handwritten. It is difficult to read the writing and there is confusion on the patient's name.
	ER	No follow-up care for patient in ER so patient given paper with follow-up orders. Leads to problems in communications.
	Pharmacy	There is no designated person or method for carrying pharmacy requests or drugs from pharmacy to ward. Causes losses.

TYPE: Operation Procedures and Personnel (between Departments)

DESCRIPTOR	SOURCE	COMMENT
Information	Other	Lack of coordination between admissions and teams caused record unavailability and duplication.
Control	Medical Record Dept.	Many patients are seen at the clinic that have not been registered at admissions. This is usually because all members of the family must register. The consequence for medical records is the inability to assign a patient number to the patient.
	Business Office	High turnover in billing dept. since it operates 7 days a week and personnel must work weekends.
	Other	Difficult to communicate operational changes to the five team areas.
Utilization	Medical Record Dept.	Dictation equipment provided by MR is only used regularly by one doctor in clinic.
		MR personnel must go to wards to get charts of discharged patients.
		The hospital has a messenger service, but it is not used to transmit records. Ward personnel go to MR to pick up records of patients with previous hospital stay. MR personnel go to wards to pick up charts of discharged patients and to insert transcribed material into the chart.
		Difficult to communicate with four separate Med. Rec. Rooms without central message distribution (center).
	Admissions	Only one person working part-time to handle all admissions.
	Nursing	Most of the communications between departments is by word of mouth and paperwork, forms, etc. are handcarried by the sender.
		No one in the hospital has a key to the pharmacy and no full-time attendant generates borrowing of drugs and missed charges.
	X-Ray	Since no advance warning is given to the wards before the patient is picked up, sometimes the orderly will arrive to pick up a patient who is not properly prepared. If a blood test is needed but was not done, the patient will be taken to radiology anyway, and the blood team paged to draw blood in radiology.

PROBLEMS

TYPE: Education and Training

DESCRIPTOR	SOURCE	COMMENT
Qualification	Medical Record Dept.	Transcription personnel with knowledge of medical terminology are difficult to hire.
		Ward personnel did not know how to obtain records during the night. A procedure manual has not been written so that the night supervisor has access to medical records when necessary.
		Not hiring trained personnel or retaining trained personnel for job openings.
		One person in department can neither read or write which creates many communication problems.
	Nursing	Teaching nurses to write good nurses note is difficult because of bad english background.
	X-Ray	They can get qualified radiologist, but not qualified X-Ray technicians.
	Pharmacy	Some team members not qualified to fill out orders for drugs but do it anyway. Orders are not filled because of improper order procedure.
		Nurses aides and ward clerks not properly trained to read medication orders.
Lengthen	Business Office	Insufficient staff in DP to properly train center staff of all procedures in source documentation.
Change Content	Medical Record Dept.	High turnover of personnel causes training problems. Training classes of more than one hour cannot be given since people cannot leave their jobs any longer. Of the six people in the filing room, none has been on the job more than one year

PROBLEMS

TYPE: Facility Design

DESCRIPTOR	SOURCE	COMMENT
Departmental Adjacencies	X-Ray	The doctors use a room for dictation which has an open doorway to the jacket file area. This creates background noise and makes it difficult for the transcribers to hear the doctor's voice.
Sizes	Medical Record Dept.	The area provided for medical records will be totally inadequate in three years.
		The M.R. Room has adequate storage provided they adhere to their plans of microfilming records in 1971.
	Business Office	The business office is much too small and there is no storage space. Many files consist of large cardboard boxes.
		Need more office and storage space.
	Admissions	Department is too small with crowded offices. This hinders the operation of personnel.
		Not enough working space -- very cramped working conditions.
	Nursing	Not enough working space at the nursing station. Consequently, if the unit had another clerk, who is needed, there would be further cramping of an already crowded station.
		Nursing station is too small.
		Nursing station is too small. Could complicate utilization of MR.
	Laboratory	There is a shortage of space and no plans for expanding the department in the immediate future.
	X-Ray	Facilities are too small for X-Ray Department.
		There will not be enough storage for X-Ray films in five years.
		Size inhibits working efficiency.
		Department was too small when hospital opened.

TYPE: Facility Design

DESCRIPTOR	SOURCE	COMMENT
Department Layout	Medical Record Dept.	Layout of departmental functions cause excessive personnel travel.
	Nursing	Large nurse unit of 56 to 58 patients difficult to manage.
	OR	The OR is located in an open area utilized by all nursing functions and separated only with a curtain.
	Laboratory	The lab has no designated place for their refrigerators so they are placed in the aisles of each lab.
	X-Ray	The department does not have a process room for floro mixtures and this must be done in the hall.
		The facilities consist of an X-Ray Procedure Room and two small development rooms. There is no storage or clerical room. This is shared with a nursing unit and other space is provided in another building.
		Pneumatic tube is located on wrong side of room.
	Pharmacy	Facility design restricts expansion.
Building Location	X-Ray	The jackets and viewers are not in the same building as the X-Ray equipment.

PROBLEMS

TYPE: Equipment

DESCRIPTOR	SOURCE	COMMENT
Design	Nursing	The card machine does not stamp charge slips clearly so than an RN must go through them when data processing sends them back for identification. Many times it is impossible to do and the charge is lost.
		Many times the chart is not available or the clerks do not have time to update the chart, thus this is done late at night and the addressograph card stamping disturbs the patients and is one of their major complaints.
		Tube system is inefficient.
	Laboratory	The pneumatic tube system fails frequently and the carrier is sent to the wrong station.
		Forms are designed to be compatible with the equipment. The equipment was not ordered by the original staff. Most equipment has been replaced and most forms have been replaced causing waste of time and money.
	X-Ray	Pneumatic tube system fails too often to use effectively.
Maintenance	Medical Record Dept.	The pneumatic tube system has not worked for the past two years.
		Pneumatic tube systems fail and X-Ray requests are held in the systems.
	ER	Have to hand carry all documents because pneumatic tube system doesn't work properly.
Other	Medical Record Dept.	The pneumatic tube system is under utilized by Medical Records.
	Business Office	There is no particular person responsible for coding the business office electrofile and very often it is miscoded, making retrieval by machine operation impossible. Then cards have to be hand retrieved.

SUGGESTIONS

TYPE: Medical Record

DESCRIPTOR	SOURCE	COMMENT
Record	Medical Record Dept.	Forms arrive at MR without proper identification. All forms should have patient's name or number. The ward clerk should have the responsibility of checking for form's completeness.
	Nursing	Change order of medical records to have clinic sheet, doctor orders and nurses notes as first three pages.
		Doctor should list patient ailment and reason for medication on chart.
		Nursing assistant should not chart. Team leader should. Only vital, not routing, information should be charted.
Process	X-Ray	DP should wait till end of month before making reports.
	Pharmacy	There would be less errors if prescriptions were filled from doctor's orders. Suggestion - that a copy be sent to pharmacy rather than the card filled by nurse.
Retrieve	Nursing	Recommends that old chart for re-admission are not routinely pulled and sent nurse station. Only on request by physician.
Transmit	Nursing	Old MR should be transmitted to the nursing station on all admissions.
Utilize	Medical Record Dept.	There should be a special medical team responsible for walking patients. This would help MR in standardizing procedures and utilizing resources uniformly.
	Nursing	RN would like to have a better way of flagging doctors' orders.

SUGGESTIONS

TYPE: Forms Design

DESCRIPTOR	SOURCE	COMMENT
Lengthen	Nursing	Duplications of green admission slip needed for private doctors and nursing homes needing patient information.
		Want admission office to add Medicare number to face sheet.
Shorten	Admissions	Need to have shortened form for reevaluation instead of using lengthy initial evaluation form.
		Need to shorten form for admission.
	Nursing	Need for more forms to cut down on writing.
	X-Ray	X-Ray request could consist of one sheet of paper.
		Should combine request into one form because three copies of X-Ray request disposed of anyway.
	ER	The number of forms that the ER sends to the lab could be reduced by designing a new form since the density per current form now being filled out is very low.
Change Content	Medical Record Dept.	The physician committee frequently suggests changes of forms.
	Business Office	Want to develop a new form to go in chart next to discharge summary for doctor to write patient diagnosis. Form would relieve problem of having to wait as long as two or three weeks to file insurance claim because of lack of diagnosis. Would also save from having to go to medical record department to get diagnosis from patient chart in order to file claim.
		Could use a maternal and infant care project form because cases of this more frequent. Have to hand-write this information or type it on bill now.
		Need standardized insurance from for all hospital patients.
		Want more copies in authorization and invoice for vocation rehab. patients because have to Xerox copies now.
		Need standardization of charge slips from different functions.

YPE: Forms Design - Suggestions cont'd.

CRIPTOR	SOURCE	COMMENT
nge ntent	Admissions	Should arrange wording to be completely written out so that forms for pre-admission can be filled out accurately and completely.
		The ER admission form should have birth date, not age. The birth date is required on insurance forms and the business office must question patient about age again.
		Wording should be simplified on admissions questionnaire.
		Should read "name of insurance" or simething similar on face of admission form.
	Nursing	List of standard medications should be put on surgical check list form. Nurse could check appropriate med. and duplication and writing cut down.
		Would like to implement a new care plan that would be placed in MR.
		There should be a general form used for all entries to reduce the physical size of a medical record.
	X-Ray	All important data could be recorded on X-Ray report form and eliminate the request form.
	ER	Need to enlarge printing on ER form and rearrange information according to categories.
	Pharmacy	Would like to change the current form used for pharmacy requests.
	Other	Two different forms for X-Ray request and report are unnecessary.
		Laboratory summary sheets would be helpful in review of patient record.
her	Business Office	Need better carbon on forms to insure readability.
		Want to go to McBee brand of request forms for better control.
		Need forms control because of frequent changes by staff.

TYPE: Forms Design - Suggestions cont'd.

DESCRIPTOR	SOURCE	COMMENT
Other	Laboratory	The lab would prefer using NCR paper rather than carbon paper because the carbon forms must be handled prior to processing test and it leaves carbon deposits on their hands.
	Nursing	Physicians Ofc. pre-natal rec. should be standard and more comprehensive.
		Recommends pasting X-Ray reports on sheet such as lab reports.
	Pharmacy	Replace pharmacist's request with copy of doctor's orders.

SUGGESTIONS

TYPE: Operational Procedures and Personnel (within the department)

DESCRIPTOR	SOURCE	COMMENT
Time	Pharmacy	Teams should schedule sending of requests to pharmacy.
Information	Business Office	Need to use a 3-sided, open-top business office jacket with information in chronological order and a checklist in front of jacket to check charges already posted.
	Admissions	Would like all pre-admitting information filled out by patient before he arrives at hospital admission desk.
	Nursing	Would like a 5 day summary of patient's condition prior to surgery. This should be done within 24 hours of surgery.
		Abbreviations should be standard.
Control	Business Office	Want charges to be written on request by department rendering service to insure accuracy of amount of charges. Charges now done on nursing unit by clerks.
		Teach others responsible duties and divide work loads for better and faster operations.
	Nursing	Prefers computerized listing of lab tests and results over retention of lab slips which are received initially reporting test results. In this ward, lab slips are frequently removed when computerized listing is received. Thinks that the hospital should decide which system will be used and eliminate the other.
	Pharmacy	Need to go to unit dosage in team situation to insure accuracy of dosage.
Utilization	Business Office	Business office needs to become automated to process routine charges.
	Admissions	Need a qualified nurse to determine emergencies from non-emergencies in admissions to save time and properly allocate time of personnel.
	Laboratory	The lab must provide tech for specimens and blood from floor. They feel a special person could be trained for this to reduce cost by keeping higher paid tech in lab.

TYPE: Operational Procedures and Personnel (within the department)

DESCRIPTOR	SOURCE	COMMENT
Utilization	X-Ray	One darkroom between two X-Ray rooms could utilize a full-time darkroom technician.
Other	X-Ray	The log book is a duplicate of record file copy and should be purged. They have logs since 1947.

SUGGESTIONS

TYPE: Operational Procedures and Personnel (Between departments)

DESCRIPTOR	SOURCE	COMMENT
Time	Medical Record Dept.	SMA receiving unit to replace lab teletype would eliminate Medical Record Dept. from having to transcribe the data onto SMA form.
	Business Office	Additional DP staff could effectively coordinate DP services between all units.
	Admissions	Admissions should send preadmitting information to insurance department before patient arrives so it can be verified before patient is admitted.
	Nursing	Imprint of 3 x 5 card for Medical Record Dept. should be done by Admissions Department.
		Waste of time for the RN to sign every chart at the beginning and end of each shift.
		A waste of time for nursing staff to personally deliver lab and X-Ray request to that department.
	Pharmacy	Pharmacy should be able to stock nursing stations routinely without having to handle stock requisition papers. Handling papers takes up pharmacists' and nurses' time.
Information	X-Ray	To avoid having to go back to ER to get doctor's name, ER should record specialist's ID number without fail.
	Pharmacy	Need to establish better communication between doctor and pharmacy to eradicate mistakes in filling orders for discharged patients.
		Nurse station should forward a copy of the doctor's orders to the pharmacist. This would decrease the error in interpretation of the doctor's orders since the pharmacist is better qualified to read orders.
		Should establish a consistent and reliable method of transporting pharmacy request and charges.
Control	ER	Combine authority and responsibility for the ER and out patient clinic for better communication and control.
	Other	Need zip card to imprint patient which is filed in the medical chart.

SUGGESTIONS

TYPE: Education and Training

DESCRIPTOR	SOURCE	COMMENT
Qualification	Other	Physicians should be better trained to cope with the social, economic and ethnic problems found in the catchment area of the comprehensive health center.
Change Content	Nursing	Would like to have conference with doctors as well as RNs on shift change reports.
	Other	Someone should instruct physicians on how to properly use forms and code.
		More stress should be placed on teaching preventive measures to the patient.

SUGGESTIONS

TYPE: Facility Design

DESCRIPTOR	SOURCE	COMMENT
Department Adjacencies	Business Office	Business office should be located centrally for the convenience of the patient and not necessarily near Medical Record Dept.
	X-Ray	Darkroom should be located in center or between X-Ray rooms.
	Pharmacy	Satelite pharmacies on wards are good if you have room.
Departmental Layout	Nursing	Layout of wards requires two or three units to share same nursing.
	ER	Need separate room for charging and paying operations. All done in RN station of ER Room. Large volume of patients per day and overcrowded.
	Pharmacy	Need new facility design for better flow of traffic and more room.

SUGGESTIONS

TYPE: Equipment

DESCRIPTOR	SOURCE	COMMENT
Design	Nursing	Tube system could be improved.
	Other	Want to get away from card system.

TRENDS

TYPE: Medical Record

DESCRIPTOR	SOURCE	COMMENT
Record	Medical Record Dept.	Hopefully the problem oriented weed system will be implemented at a later date to improve quality of the medical records.
	Nursing	Plan to implement Hurst-POMR which will change MR procedures.
		The concept of the problem-oriented Medical Record was introduced five months ago to this ward. The nurses and clerks like the idea. It improves understanding of patient's condition.
		The problem-oriented Medical Record will improve nurse understanding.
	Other	The director is presently working on a problem sheet form which he would like to implement.
Process	Medical Record Dept.	MR will eventually be given the responsibility for maintaining Emergency Room records.
	Nursing	Order of Medical Record changed on ward to improve use by nurse.
		Two nurse teams per unit improves patient care and nurse notes in Medical Records.
		The staff is in the process of trying to implement internal changes in communications and procedures concerning MR.
		Dictation has greatly improved doctor input to MR by the use of a remote pneumatic system.
Store	Medical Record Dept.	Formerly records were stored in closed cabinets. Open shelf filing has made access much more simple.
		The storage at MR is being decentralized to teams which will keep active patient files while the main MR department stores inactive files.
		Color coding and terminal digit filing has cut down significantly on filing errors.

TRENDS

TYPE: Medical Record

DESCRIPTOR	SOURCE	COMMENT
Store	Nursing	Would like to see medical record on microfilm. Some patients have medical record which consists of several volumes. When a medical record of this size is sent to wards with a patient, it occupies too much space. Microfilm viewers could be used on the ward to look at patients prior admissions medical record.
Retrieve	Nursing	Supervisor has ordered chart dividers as the records on this ward tend to be lengthy, thus impairing rapid use.
Utilize	Business Office	The problem-oriented medical record will enhance the use of the medical records by team physicians and provide a better record for computerization.
		Medical record audit will be used in the future to improve quality of patient record and patient care.
	Nursing	Nursing service is trying to set up a committee to rate nursing notes and try to upgrade them.
		POMR will improve nurse's understanding of patient thru problem list.
	Other	Prior to decentralized record keeping, many charts were missing, wrong numbers were placed on information sheets concerning patient, and transmission time was greater.
Other	Other	The director feels that in the future other outside institutions will be auditing their medical records.
		In the future this floor will handle Medicare patients only which may change current MR procedures.

TRENDS

TYPE: Forms Design

DESCRIPTOR	SOURCE	COMMENT
Shorten	Nursing	Supervisor is working on a new form which will combine several old ones in CCU.
Change Content	Business Office	Want to begin using the standard A-92-R billing claim form. This will take place of several forms now being used.
	Nursing	Nursing service has been working on a medication form which should save RNs some time in charting. All floors are on the unit dose drug dispension. Two other forms containing TPR, I&D, and RN's notes will also have to be changed as a result.
		In process of changing nursing forms.
		TPR graphic sheet is being changed to allow for one week of data to be entered beginning on Sunday each week.
		Pediatrics is in the process of creating a new nurse's worksheet which will include J&O, TPR, and nurse's notes. The J&O will be recorded hourly and each sheet runs through A 24.
		Pharmacy slips will soon change due to change to unit dose. Nurse would like color coded chart sheets and lab sheets.
		New phar. request will save on pilferage by nurse staff.
		This floor is trying out a nursing problem sheet to be inserted into the chart;they are also trying out a new graphic sheet covering seven days instead of five.
	Laboratory	They are in the process of changing their lab requests. This will be the first change in the history of the hospital.
	X-Ray	The X-Ray request was changed three years ago and will continue to change to meet the hospital demands.
	ER	ER form redesigned within last year.

TRENDS

TYPE: Forms Design

DESCRIPTOR	SOURCE	COMMENT
Change Content	Pharmacy	New pharmacy form will eliminate transcription of doctor's orders.
		Have designed new form to be used with unit dose system that will be running record of drugs administered to patient and will become part of patient's chart upon discharge.
		New pharmacy form will improve doctor-pharmacy communication.
Other	Other	Have changed to a special pediatric admitting form and nursing note.
		Mental Health to begin developing their own forms.

TRENDS

TYPE: Operational Procedures and Personnel (within the Department)

DESCRIPTOR	SOURCE	COMMENT
Time	Business Office	Want and need computer to produce a totaled summarized statement to send to insurance companies because they won't accept a daily report. Totals done by hand now.
Direct Cost	Medical Record Dept.	Are hopeful to eventually use a computer capability for indexing using P.A.S. system.
Information	Pharmacy	New pharmacy form will require phone calls to pharmacy on patient discharge.
		Going on unit dose system February 1971 and designed new pharmacy request form.
Control	Other	Pharmacist wants to go to unit dose system to make charging easier and increase sanitation and accuracy of dosage.
Utilization	Pharmacy	More use of pharmacy technician is coming.
	X-Ray	Will implement the Ames visible filing system in three or four months. Only those X-Ray jackets used after installation of the system will be converted.
	ER	Going to initiate a triage area with a nurse directing patients to proper areas for treatment in the ER.
	Other	Plan to hire full-time medical record clerk to coordinate and manage medical records.
Other	Business Office	Proposal has been made to microfilm paid-out records. This would be storage and retrieval system.
	Pharmacy	Chance that a pharmacist will go to floor and supervise administering of drug to patient to insure accuracy of dose.

TRENDS

TYPE: Operational Procedures and Personnel (Between departments)

DESCRIPTOR	SOURCE	COMMENT
Information	Business Office	Data Processing is developing a patient profile that will be given to team prior to patient appointment to improve accessibility of medical data.
	Pharmacy	Will be filling orders from copy of physician order in the pharmacy in the near future.
Control	Pharmacy	Pharmacy should fill physician orders from a direct copy of the order. Would reduce errors since pharmacists acquainted with terms used. Would remove nurses from order cycle and give them more time to devote to nursing duties.
Utilization	Nursing	POMR would improve nurse care greatly.
Other	Pharmacy	Drug losses have decreased with the implementation of unit dose.

TRENDS

TYPE: Education and Training

DESCRIPTOR	SOURCE	COMMENT
Change Content	Nursing	Starting next month the staff RNs will begin classes on RN charting.

TRENDS

TYPE: Facility Design

DESCRIPTOR	SOURCE	COMMENT
Size	X-Ray	Plans for expansion 1971.
		Plans for the addition of 2-0 beds in four or five year call for the expansion of Radiology into Pharmacy and part of the Emergency Room. Inpatient and outpatient waiting and service areas will be separated in the new design.
	ER	Plans have been made for a new ER to accommodate increasing volume of outpatients and emergencies.
Department Layout	Medical Record Dept.	The medical room was designed for microfilm storage.
	X-Ray	New facilities will be designed on basis of predicted workload.

TRENDS

TYPE: Equipment

DESCRIPTOR	SOURCE	COMMENT
Design	Medical Record Dept.	Dictation equipment, teletran, has five input locations - 1 per nursing unit and 1 in medical records which improves stenographic throughput.
		The Xerox machine has been a significant addition to the Medical Record Dept. Now rather than sending the original record out, a copy may be sent. Copies are acceptable for court cases.
		Need an automated master patient file for 125,000 medical records.
		Power files for this size hospital are a luxury but director says now she "wouldn't do without one". Improves retrieval of very active files.
	Business Office	Each room in the future should be equipped with a closed circuit camera and monitor to permit 2-way visual communications.
		Expect to have IBM2790 terminals in nursing stations within one year for laboratory orders.
		Starting work on hooking up autoanalyzers to computer. Expect to have it tied in by beginning of 1971.
		Business manager predicts the Business Office will be on computer for billing in three to five years.
	Nursing	Mixed feelings about computerized lab results on terminal in ward, which is planned for near future. Where will the terminal go? No room. However, the terminal should eliminate many calls to the lab for lab results.
		Director is screening equipment with administrator. Several computers for patient information are being considered.
	Laboratory	Within a year they will be using only computer system for the lab report, for all inpatient reports except for blood bank, bacteriology and special procedures.
		Computer system is way to go in the future although it will buy the lab almost nothing. It will help in research studies, also it will give current, fast data to wards.
Other	Laboratory	Expects to have computer to handle lab requests and reports.

SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA

FINAL REPORT

TO:
REGIONAL MEDICAL PROGRAMS SERVICE
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
CONTRACT NUMBER - HMS 110-70-349

VOLUME II
STATE OF THE ART REVIEW

HEALTH SYSTEMS RESEARCH CENTER
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA

HEALTH SYSTEMS DEPARTMENT
WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PENNSYLVANIA

SEPTEMBER 1971

SYSTEMS ANALYSIS

OF MEDICAL RECORDS

IN GEORGIA

FINAL REPORT

This project was conducted under contract HSM 110-70-349
awarded by the Regional Medical Programs Service
of the Health Services and Mental Health Administration

VOLUME II

STATE OF THE ART REVIEW

Health Systems Research Center
Georgia Institute of Technology
Atlanta, Georgia

Health Systems Department
Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

September 1971

PREFACE

The present volume, Volume II of a three-volume final report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, contains a survey of the state-of-the-art of medical records systems. This volume, entitled STATE OF THE ART REVIEW, is submitted in accordance with the provisions of United States Public Health Service contract HSM 110-70-349. Volume I contains a summary of the project, and Volume III contains a description of four analytical methods which can be used to evaluate procedures for processing, entering, storing, and retrieving medical record information. The project was conducted jointly by the Health Systems Research Center of the Georgia Institute of Technology and the Health Systems Department of Westinghouse Electric Corporation for the Regional Medical Programs Service of the Health Services and Mental Health Administration in the period July 1970 through September 1971.

The objectives of the project were to describe the state-of-the-art in medical records systems and to develop analytical methods for studying and improving medical records systems in health-care facilities. During the course of the project, twelve hospitals, five nursing homes, and one neighborhood health clinic were studied by the project team.

At each facility, data on the management and flow of medical record information were collected by using one or more of the four methods developed in the project. The purposes of the data collection were: (1) to test and refine the methods and (2) to construct a profile of basic information regarding the use and maintenance of medical records systems. During the course of data collection and methods development, two proprietary computer programs of the Westinghouse Electric Corporation were employed; these programs were the Network Analysis Method and Work Sampling Method. Also, the method described in Chapter 3 of Volume III was based largely upon the Hospital Staffing Methodology for Medical Records, which was developed at the University of Michigan. Data regarding the state-of-the-art in medical records systems was obtained via direct inquiry to manufacturers and users of these systems. An extensive bibliography of journal articles and project reports was also prepared. Neither an examination of the medical-decision-making aspects of the medical record nor an analysis of the quality of the medical information residing in the medical record were included in the project. While these topics are important, their consideration was beyond the scope of the project.

The successful completion of this project was due to the efforts of various individuals, institutions, and groups to whom credit is gratefully extended. Important contributions were made to the project by the following on behalf of the Health Systems Research Center: John W. Coyle, Gerald L. Delon, Chris C. Efland, Terrance M. Patrick, James F. Smith, Karenan P. Stubbs, and Gerald B. Widegren. Major contributions were made to the project by the following members of the Health Systems Department: Charles C. Camp, Edwin E. Keelen, Frank W. Koenig, and Stewart F. Paterson. The present volume was written by Mr. Camp.

Appreciation is extended to Dr. J. Gordon Barrow and the staff of the Georgia Regional Medical Program for their advice and cooperation. Also, acknowledgement is given to the several consultants and members of the advisory board to the project for their valuable contributions and active interest.

In particular, sincere appreciation is extended to the many medical records librarians, administrators, nurses, physicians and other personnel who so graciously and generously contributed their time and thoughts to the project. Their busy schedules were interrupted for extended periods of time, and the project could not have been completed without their assistance.

Harold E. Smalley, Director
Health Systems Research Center
Atlanta, Georgia
September 28, 1971

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CHAPTER I

STATE OF THE ART IN MEDICAL RECORD SYSTEMS

1.1 INTRODUCTION

The medical record system is a file of medical data which provides:

- Historical data on past illnesses and treatment
- A statistical base of disease incidence and treatment methods
- A means of auditing physician health care delivery
- Information for the collection of charges incurred during hospitalization.

This document is concerned with systems using innovative techniques in medical record procedures and not with the specific medical content of the record. The various medical record systems can be characterized by:

- Input and retrieval methods
- Transmission characteristics
- Storage procedures.

1.2 MANUAL HARD COPY MEDICAL RECORD SYSTEMS

1.2.1 Input Methods

The most common medical record systems found in today's health care facilities are manual systems using hard copy (paper). All data are recorded by the physician or ancillary personnel. A variety of forms are used, which are loosely filed in a manila folder or sectioned by type of information within the folder. In more sophisticated manual systems, the physician or other professional dictates summary information, which is then typed and reviewed by the physician prior to its inclusion in the medical record. Such a system is installed at St. Luke's Methodist Hospital in Cedar Rapids, Iowa. At St. Luke's physicians can dictate medical data from any telephone in the hospital's dial system or from telephones in their offices or homes through central recording units in the hospital's Medical Records Department.[1] St. Vincent's Hospital and Medical Center,

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[1] Toussaint, Jack L. "Central Dictation System Promotes Complete and Legible Medical Records," Hospitals, J.A.H.A., Volume 40 (January 1, 1966), pp. 44-45.

New York City, also uses a central memory dictation system.[2] Most manufacturers of central continuous tape dictation devices recommend the inclusion of stand-alone dictation devices.

1.2.2 Retrieval Methods

Retrieval methods are dictated by the degree of accessibility of various records. As the record's age increases, the storage location becomes more remote. If a record is accessed several times a day, it will be stored near the user position. The record may stay in a location from five to twenty-five years or more, at which time it may be purged and placed in a more remote storage site. Once placed in an archival location, records are not generally retrieved, except for emergency or rare research activities. Color coding, terminal digit filing, power files, and automatic retrieval mechanisms aid in accessing medical records.

1.2.3 Transmission

The primary method of transmitting hard copy data in modern hospitals is to install a pneumatic tube system between work stations. Mechanized carts, gravity chutes, dumb waiters, and various types of conveyor systems are also used to transmit medical records. The Mayo Clinic in Rochester, Minnesota, uses a combination of gravity chutes, dumb waiters, conveyor belts, and pneumatic tube systems to transmit medical data among the outpatient clinic, two inpatient facilities, and a central record storage area.

Several facilities have installed an automated track-guided powered cart (Mosler Telelift) to transport medical records between selected locations in the hospital. Others are using the Telelift System as a general materiel handling system which incorporates the transmission of medical records.

1.2.4 Storage Characteristics

Open file, terminal digit storage is the most common method of storing hard copy medical records. In terminal digit indexing, active

[2] Kanon, Don. "Patient Information Utilizes Central Dictation," Hospitals, J.A.H.A., Volume 43 (October 1, 1969), pp 56-57.

medical records are divided into 100 files according to the last two digits in the medical record number. For example, a record numbered 263,421 would be witten as 26-34-21, and would be filed according to "21" -- the terminal division. Since the same amount of old and new files will likely be allocated to each of the 100 divisions, file expansion is easy. To aid clerks in locating records and to prevent misfiling of information, a color may be assigned to each digit in the terminal division and the files would be marked accordingly. The use of social security account numbering coupled with a terminal digit method is presently being explored.

Medical records are usually stored in several locations during their lifespan; for example, the record of an inpatient's previous episodes of inpatient care may be stored in a central file, and his current active records located on the ward. In a dual record system, the inpatient record is stored in one location while the outpatient record is in another. As a result of multiple-location filing, access may be difficult.

Some very costly systems are available that automatically box and mechanically shelve record data, but none is operational in a hospital at this time. Such a system is Remington's Rand-Triever II, which automatically retrieves records and transports them to a console location. The operator requests files or containers by using a seven-digit code via digital keyboard or by inserting a punched card under an electronic sensor. The coded containers deliver up to fifteen file folders to the console station. The storage modules (shelves) for the file containers can extend horizontally almost indefinitely and vertically up to 22 feet, with only 15 inches clearance required between modules. Up to fifteen thousand file folders can be stored in one hundred square feet of storage space.

To save space in the file room, mobile storage units are available. By mounting rows of files on mobile bases, or dollies, the file rows can be pushed against each other (reducing the space needed) and separated to form an access aisle only when necessary.

1.3 MICROFILM MEDICAL RECORDS SYSTEMS

The most common hospital microfilm systems use a photographic process of recording hard copy information on 16 millimeter film. The data may be stored on the microfilm roll, aperture cards, or microfiche. Microfilm can be processed in 35 and 70 millimeter sizes. Microfilm is most commonly used for archival purposes; medical records are normally 10 to 25 years old before they are microfilmed and placed in limited access storage areas.

1.3.1 Input Methods

The primary method of manufacturing microfilm is to photograph original or duplicate hard copy. A more sophisticated method is to generate the microfilm directly from digital computer data -- computer output to microfilm (COM). COM is not used in any current medical record systems, since no operational system has complete medical records in machine-readable form. (See Section 1.5.1)

1.3.2 Transmission

The easiest way to transmit microfilmed information is to use a manual or mechanical transport system between the storage and user locations. The most advanced transmission method is by a closed circuit television system, such as the Sanders Diebold Systems 500 and 550. The Washington Medical Data Center is planning to install the Mosler 410 linked to an IBM 360 computer. This system will make current microfilmed data immediately available in remote locations via video monitor.

1.3.3 Storage Characteristics

The storage requirements for microfilm are very similar to those of hard copy data, but because of the reduced size, several innovative techniques have been used. Microfilm can be embedded in an IBM or aperture card and then stored and retrieved automatically by using the data punched into it. Microfilm rolls can also be indexed and searched automatically. There are several methods of storing and retrieving microfiche or microfilm which are nearly automatic. The most sophisticated method is the Mosler System 410, mentioned above. Although available in various configurations, the Mosler System generally stores the microfiche in samll boxes. The boxes are addressed by the computer and then mechanically retrieved to a position where they are automatically extracted, reproduced, or viewed via closed circuit television.

1.3.4 Retrieval Requirements

To use microfilm data, a reader that conforms to the microfiche used or a means of producing hard copy from the film is necessary. Consequently, microfilm will not be readily useable in all hospital locations, unless the physician or other medical record users have some type of device to display the recorded information. Microfilm readers range in price from eighty to several thousand dollars.

1.4 COMPUTERIZED HARD COPY MEDICAL RECORDS SYSTEMS

1.4.1 Input Methods

In systems which use both computers and hard copy, the computer serves as a communication device for medical record inputs. For example, an EKG may be analyzed and temporarily stored in a computer, or the computer can be used to collect and summarize laboratory data for display on the nurses' ward or outpatient area. Hard copy, on the other hand, is normally generated for information such as laboratory results, pharmacy requests, or accounting data. The hard copy is then stored in the manual medical record file system. In most systems, a machine-readable form such as magnetic tape is also generated for additional summarization and accounting procedures.

1.4.2 Retrieval Methods

If the information is in a computerized form, it may be retrieved by the various methods discussed in the communications state of the art, such as teletype, cathode ray tube, or the common IBM card. If the data are not in the computer process form, the retrieval requirements are the same as those for manual hard copy.

1.4.3 Transmission

Transmission of data from the computer system to the manual system will normally reflect the operating characteristics of each facility, which may be messenger, teletype, pneumatic tube, or electronic communication.

1.4.4 Storage Characteristics

Selected portions of the medical record may be stored in a computerized system; for example, the laboratory data may be stored in the computer for up to fourteen days, at which time a summary report is printed out and stored in the manual record folder.

1.4.5 Users of Computerized Hard Copy Systems

Danderyd Hospital in Stockholm, Sweden, has computerized the medical records of 1.4 million patients, and the country's 14 other hospitals will eventually hook up to the computer center. The computer will soon schedule patient admissions and use of facilities such as operating rooms and test laboratories. "Ultimately, country health planners say, the Danderyd system will encompass every aspect of medical management, control and treatment for two million people."[3]

Julius Korein at the New York University Medical Center has developed a system for "entering minimally structured narrative medical data into a computer using the Variable-Field-Length (VFL) format technique."[4] The system can be used for narrative medical data and medical services, clinic, and other types of documents.

Three levels of computer processed data are used: (1) on-line real time which involves immediately retrievable data (ID data, patient appointments, and data essential for urgent patient care); (2) on-line demand in which response time may vary but is usually rapid and which is used for data entry; (3) off-line, batch which usually takes several hours and possibly days and is used for data analysis.

In on-line, demand a teletype interacts with the large computer system (Univac 1108, 131 K core). In on-line, real time, the teletype or CRT terminal interacts with a large computer system via a smaller satellite computer (Digital Equipment Corporation PDP 8 K core). Off-line capture of data is via paper tape or magnetic tape typewriters.

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[3] Medical World News, (December 12, 1969), p 28.

[4] Julius Korein, "The Computerized Medical Record: The Variable-Field-Length Format System and its Applications," presented at the IFIPs TC 4 Conference, April 1970. Published 1970.

The Permanente Medical Group in Oakland, California, is also using a variable-length, variable-format medical record to permit the continuing collection and storage of all essential inpatient and outpatient data.[5] The medical record is organized on a tree-branching-structured basis and contains identification, administrative, and medical data sections. The medical data section is partitioned into patient visits and includes items such as medical history, tests, and diagnoses.

An IBM 2321 Data Cell Drive is used for permanent storage of active medical records. But when a patient is under actual care in the hospital, his record is moved to random access disc drives (IBM 2311 Disc Drives) which offer more rapid access. Input devices include CRT visual display terminals, punched cards and paper tape, keyboards, and electric typewriters recording directly on magnetic tape.

1.5 COMPUTERIZED SYSTEMS NOT REQUIRING HARD COPY

Using today's technology, a totally computerized medical record system requiring no hard copy is possible, but no hospital is currently using such a system. One of the first attempted was the Lockheed System, designed to develop a completely computerized patient-physician interactive system at the Mayo Clinic. The system, though, was never implemented at the Mayo Clinic because of a lack of federal developmental assistance. Although several systems on the market today claim to be totally computerized, they do not generate the entire medical record.

1.5.1 Computer Microfilm Systems

In a completely computerized system, medical records can be stored in microfilm generated by the computer. This system is commonly called COM -- computer output to microfilm. The expensive storage requirements of computers are avoided by lower cost microfilm storage; however,

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[5] Davis, Lou S.; Collen, Morris F.; Rubin, Leonard; and Van Brunt, Edmund E. "Computer-Stored Medical Record." Reprinted from Computers and Biomedical Research, Volume 1 (May 1968).

the conversion of digital information to microfilm is currently very expensive. No hospital systems are currently using this type of conversion, although it was previously attempted by National Data Communications. The input, transmission, storage, and retrieval requirements would be the same as those of the computerized hard copy system discussed above.

1.5.2 Computerized Videotape Record Systems

Joseph Saxl has proposed a hospital information system based on the concepts of visual image retention, computerized access, and immediate decentralized visual display. Chart data would be input via video camera, and addressing information via a touch-tone keyboard. Computer output would be displayed on a video screen or printed by an electronic copier.[6]

1.6 TOTAL MEDICAL RECORD SYSTEM

The most unique total medical record system under development is that of Dr. Lawrence Weed at the University of Vermont. Dr. Weed's problem-oriented patient record, which is well suited for computerization, separates the medical record into four major divisions: (1) the data base; (2) the problems list; (3) treatment plan; and (4) discharge summary. Each problem identified with a patient is sequentially numbered, and all laboratory, radiographic, diagnostic, and treatment procedures are given for the associated problem. This method of record keeping is currently being introduced at several medical schools.

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[6] Saxl, Joseph. "An Innovative Medical Information Storage and Retrieval System." Hospital Progress, February, 1971, pp 46-48.

CHAPTER 2

INNOVATIVE RECORD KEEPING SYSTEMS

2.1 INTRODUCTION

Six computer systems representative of advanced techniques in medical records and hospital data management are described below. They have had considerable impact on the health care market, and each is currently installed in one or more hospitals in the United States. For a comprehensive listing and product line description of manufacturers of medical record and hospital data management systems, see Chapter 3.

2.2 NATIONAL DATA COMMUNICATIONS CORPORATION'S REAL-TIME ELECTRONIC ACCESS COMMUNICATIONS FOR HOSPITALS (REACH) SYSTEM

REACH is a totally integrated communication and data management system which allows direct access to the computerized data base via a specially designed cathode ray tube (CRT). A user identification card in conjunction with twenty function keys located at the left of the CRT screen allow the physician, nurse, or technician to select standard phrases, which can be used to store a patient's medical record. Standard phrases may be used to request laboratory procedures and results, patient's condition, and radiographic and x-ray procedures. If required, a pharmacy label will simultaneously be printed in the pharmacy.

Most medical or administrative data can be handled by the programmed statements on the CRT screen. Used along with a standard typewriter keyboard, the function keys can also enter information such as pre-admission, scheduling of ancillary services, patient accounting, or narrative medical data. Nurse's notes, doctor's orders, patient history, and narrative progress notes can be typed into the patient's record by typists or ward clerks. Information is made available on a "need to know" basis; all staff members have identification numbers which give them access only to appropriate data.

2.3 THE IBM CORPORATION'S MEDICAL INFORMATION SYSTEM PROCESSOR (MISP)

The MISP package, the most widely used hospital information system, is an executive control program capable of providing message switching and a communication network from remote terminals on a real-time basis. MISP requires a 32K core memory, is designed for DOS (Disc Operating System) and OS (Operating System) and is programmed for both the IBM 360/30 series of computers and larger systems. It is currently operating on IBM Models 30, 40, and 50.

Data entry and output are primarily from IBM 1092/1093 programmed keyboards and the 1052 typewriter, not CRT screens. Another input/output component is the split-screen optical-image device which shows fixed data projected from a 16 millimeter film strip cartridge on the right side and transparent overlays on the left. The operator communicates with the computer using a light-sensitive probe to touch the appropriate information displayed on either the left or right or both sides of the screen. A CRT (Model 2260), with or without light-pen device, is available and is being used at several locations for admissions procedures and rapid file access applications.

Application programs such as the Shared Hospital Accounting System (SHAS) are available from IBM and from the Hospital Information System Sharing Group, Inc. The Sharing Group is a nonprofit group of IBM system users that exchange application programs and experience.

2.4 BURROUGHS CORPORATION ON-LINE MEDI-DATA SYSTEM

The Burroughs system, based on a totally time-shared concept, can serve 1,500 beds in multiple locations. Its major advantage is that remote sites can use large scale computers. Each hospital may have up to 250 terminals. All hospital teletypes (R035) are controlled by a small in-house computer (B300) which interfaces with the central data processing facility. The central facility has three maximum core capacity Burroughs 5500 computers.

The user can directly interface with the central files by using a CRT and a typewriter keyboard. A specially trained terminal operator (ward clerk) may enter all orders and results into the CRT terminal;

expanded orders are immediately printed at the service area. The doctor's handwritten orders and patient history are maintained in the conventional ward chart.

Departmental work schedules, statistical logs or test results, patient bills, and administration reports are available through an information retrieval program at each CRT terminal. Results of work done by auxiliary services, such as test results, are transmitted to the central computer facility and redirected to the appropriate nursing station where the printout is manually inserted in the patient's chart.

2.5 TECHNICON MEDICAL INFORMATION SYSTEM (FORMERLY LOCKHEED MIS-I)

The Technicon system is a centralized medical data service center that serves hospitals within a 50-mile radius. Each hospital is provided with natural language interactive CRT terminals using a light sensing pen and typewriter keyboard. The Technicon System, which can serve up to 2,400 beds, combines the time-sharing concept previously discussed in the Burroughs System with rapid access to the time-shared 360/40 computer by all system users. A distinct advantage of the system is the efficient data formulation and review procedure for physicians at the CRT terminals. Quiet inktronic print terminals manufactured by A. B. Dick Company are available. System operation is very similar to that of the systems discussed above.

2.6 THE MEDELCO COMMUNICATION SYSTEM "T.H.I.S."

This system is used primarily for data input and transmission, rather than for on-line data retrieval. Card readers feed data from coded, pre-punched cards into the central processor. The central processor then sorts the data and instantly transmits it to appropriate print terminal locations throughout the hospital. For example, to schedule a patient for radiology, a nurse would place the patient's identification card and card-punched instructions to radiology in the card reader at the nursing station. Information is printed at the nursing station for verification and simultaneously transmitted to radiology for scheduling. This same action would initiate the transmission of diet change information to the kitchen and the calculation of patient charges which are stored in the central processor until the end of the day. Charges are generated in a daily batch output compatible with most batch-oriented computer systems.

2.7 PROBLEM-ORIENTED MEDICAL INFORMATION SYSTEM (LAWRENCE L. WEED, M.D.)

The Problem-oriented Medical Information System (PROMIS) Laboratory, currently located at the Mary Fletcher Unit, Adams Residence, Burlington, Vermont, is the most unique medical record developmental concept to date. Dr. Weed has restructured the traditional medical record to make it problem-oriented and has developed the software which computerizes the narrative and numeric data. The "Problem-oriented Medical Record" exists in a Control Data Corporation 1700 computer with appropriate peripheral hardware. The record is broken down according to present illnesses, progress notes, flow sheets, problems list, admissions summary, discharge summary, and history and physician data.

The Control Data Digiscribe Cathode Ray Tube and the Computex 100 unit (with Digiscribe attachment) is the principal input medium using a dynamic branching technique developed by the PROMIS Laboratory. Data is input via standard format statements appearing on the CRT screen by touching a touch-sensitive strip on the face of the tube. Data also may be entered via the standard typewriter keyboard attached to the CRT. All patient care related data can be entered or retrieved by this method on a selection basis by physicians or specified allied health professionals.

The system does not currently interface with the pharmacy, clinical laboratory, radiology, or other ancillary support areas. However, the communication network requirements can be easily handled by Setran Software. Once the total communication network is expanded from one ward to all its supporting areas, a ward by ward expansion will be undertaken until a total hospital information system is implemented.

2.8 SYSTEMS MODIFICATIONS

Many health care facilities have a particular modification of one of the alternative medical record systems discussed above. These differences result from personal preferences, hardware differences, type of health care provided, and local legal requirements. No system has completely eliminated hard copy. However, as the medical information systems become more complex and computerized, the volume of hard copy transmitted and stored decreases. This also applies very emphatically to microfilm systems.

CHAPTER 3

MANUFACTURERS OF MEDICAL RECORD SUPPORT SYSTEMS AND HARDWARE

3.1 INTRODUCTION

The major vendors of medical record and hospital information systems and equipment are listed in Section 3.2. Additional vendors can be found in the various trade journals and seen as exhibitors at health-related trade shows. Section 3.3 contains matrices which summarize the results of a questionnaire sent to these manufacturers in order to identify the major vendors selling to medical record departments. Manufacturers not responding to our state-of-the-art survey are presented in Section 3.4. These manufacturers are included in order to identify as many as possible of the users and producers of innovative medical records systems.

3.2 INDEX OF MANUFACTURERS

Vendors of medical record support systems and hardware are categorized below according to the following product types:

- Hospital information systems
- Communication systems
- Laboratory information systems
- Microfilm systems
- Filing systems

3.2.1 Hospital Information Systems

Anthony J. J. Rourke, Inc., Hospital Consultants

Automated Health Systems

B-D Spear Medical Systems

Bio-Chemical Procedures

Bunker-Ramo Corporation

Computer Instruments Corporation

Com-Share, Inc.

Control Data Corporation

Hospital Automation

IBM Data Processing Division

Litton Automated Business Systems

McDonnell Douglas Automation Company

Medical Information, Inc.

Medicus Corporation

Mediquip Corporation

Medlab Computer Services

RCA Corporation

Sanders Associates, Inc.

Shared Medical Systems

Spectra Medical Systems, Inc.

Symbronics Systems, Ltd.

Technicon Medical Information Systems, Inc.

3.2.2 Communications Systems

Dictation, Inc.

Telautograph Corporation

Teletracer International Corporation

Victor Comptometer

3.2.3 Laboratory Information Systems

Bio-Medical Computer Service, Inc.

Bio-Logics, Inc.

Laboratory Computing, Inc.

3.2.4 Microfilm Systems

Arcata Microfilm Corporation

Eastman Kodak Corporation

Mosler Information Systems

3.2.5 Filing Systems

Smead Manufacturing Company

Standard Register Company

Supreme Equipment and Systems Corporation

Visirecords Division of Berry Right Corporation

3.3 MEDICAL RECORD SUPPORT SYSTEMS AND HARDWARE

In the following matrices, the point of contact, current product or systems, and products projected over the next five years are listed for each manufacturer of medical records support systems.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
Automated Health Systems 1588 Gilbreth Rd. Burlingame, Calif. 94010	Don Segal	Automated history taking devices have been used at Children's Hospital, San Francisco, since February, 1971, and a clinical lab system will be operational at the San Francisco General Hospital in September, 1971. The Automated Health Systems concept includes the use of prototype CRT terminals and the mobile document reader. All programs are written in M.U.M.P.S. (high level language, dynamically allocated, tree-structured disc filing system). The system is currently operating on PDP-15 and PDP-11 computers.	A total multiphasic screening hospital. Also building and clinic scheduling systems.
B-D Spear Medical Systems 35 Dear Hill Road Waltham, Mass. 02154	B. Rodman Tuttle Director of Marketing	The B-D Spear pharmacy and laboratory information system uses real-time cathode ray tube displays at the departmental level.	A total hospital information system using the B-D Spear 300 Computer.
Bio-Medical Computer Services, Inc. 360 Hamm Building St. Paul, Minnesota 55102	John R. Krismer Executive Vice President	Bio-Medical Computer Services has designed registration, admissions/discharge/transfer/census, medical records, accounts receivable, pharmacy, and laboratory subsystems. Fifteen applications are currently being implemented. The hospital information system includes CRT-Finger Touch Switching and the hard copy printer concept using a pre-formatted method. Selections are made from the CRT by touching the screen.	Fifteen new applications.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
The Bunker-Ramo Corp. Oliver Plaza Suite 726 Pittsburgh, Pa. 15222	Samuel M. Begg MIS Representative	Bunker-Ramo provides devices and Series 200 and 2200 data displays to hospitals across the country that are implementing total hospital information systems. The systems are currently used with the IBM 360/40, IBM 1440, IBM 1800, IBM 360/30, and other hardware in the design of on-line hospital information systems. Subsystems include laboratory, admissions, medical records, accounts receivable, patient records, psychiatric records, pharmacy, dietary, patient monitoring, and others.	Unknown
Com-Share, Inc. 1910 Cochran Rd. Manor Oak #1 Pittsburgh, Pa.	William J. Barkley, III	Com-Share provides time-shared services on a nationwide basis using the Xerox Data Systems Model 940 computer. The basic software package available to hospitals is the Multiple Analysis Retrieval System (M.A.R.S), which is a retrieval and analysis system for tabular data structures. Hospital packages currently in operation include the Patient Information and Retrieval System, Analog Simulation of the Human Circulation System, and several dose programs for radiation therapists. Terminals currently used in the hospital are the GE Datanet Terminal and the Teletype ASR 33 Terminal.	Unknown

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
Control Data Corp. 8100 34th St. Minneapolis, Minn. 55440	John W. Oden	The Control Data Corporation has currently installed intensive care and physiological monitoring, automated clinical laboratory, hospital administrative and medical records, and EKG analysis systems. Installed systems use the CDC 1700/1700/3170 Computer and the 1700/1700/CYPER/70. Real-time computer input devices such as the teletype, controlled data CRT mark/sense readers, special input consoles for automated lab, and others are available. These are slowly being integrated into a structural transaction-oriented operating system capable of using a totally shared data base.	Multiphasic screening, medical orders, medical records, and admin-strative systems.
Hospital Automation 400 Washington Street Hartford, Conn. 06106	R. Peter Ericson	Hospital Automation provides on-line master patient records, automated nursing notes, Minnesota Hartford personnel assay, and Minnesota Multiphasic personnel inventory systems using the IBM 1440 Computer with Bunker-Ramo Model 200 video terminals. CRTS are located in medical redords, admissions, nursing supervisor's area, executive area, pharmacy, data processing, one nursing unit, and a demonstration area. The pharmacy currently has one teletype. The system has been in operation for over five years and is in the process of conversion to Univac hardware.	A total hospital information system using time-sharing and a data base management system.

PROVIDERS OF MEDICAL RECORD
SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
International Business Machines Data Processing Division 10401 Fernwood Road Bethesda, Md. 20034	Robert W. Kukla Health Care Systems	IBM software and hardware currently serve numerous customers with both batch and remote terminal subsystems in medical information and administrative applications. Hardware includes the IBM 1440 series; IBM 360/30 through IBM 60/65; the IBM 370/135, 145, 155, 165; and the IBM 1800 main frame computer. Real-time devices include CRTs; remote batch terminals such as 2770, 2780, F/3, 360/20, 1130; lower speed interactive terminals such as 1050, 2740, and 2741; optical image unit 2760; remote intelligience processors (EG system/7); and programmable terminals (3735).	New developments in patient care, clinical education, and research areas. Emphasis will be on tailoring ability, sharing concepts, and integrating all subsystems under common data base and executive programs.
Litton Automated Business Systems Carlstadt, New Jersey	Don Ferguson	Litton Industries currently produces several source data collection systems as well as conversion equipment. The main products are the 9600 card converters and the 64 optical mark readers, which are supported by the EBS 1231 and 1241 computers with main core memories ranging from 8K to 16K. The Litton edge-punched card is used in many hospitals as a source data acquisition system. Edge-punched cards in conjunction with the 9600 card converters and other equipment are the primary means of collecting patient charges for laboratory and x-ray procedures.	A totally automated hospital system.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: Hospital Information Systems

Company	Point of Contact	Current Product or Systems	Future Products
McDonnell Douglas Automation Company 1124 N. Berkley Ave. Bureau, Illinois	Walter S. Huff, Jr.	McDonnell Douglas provides a complete line of hospital communications and accounting systems using the IBM 360/50 computer series and associated software. Peripheral devices include IBM four-phase CRT 1050 terminals and 105092 multiple keyboard terminals. Applications include admitting, reservations, discharge system, radiology ordering and reporting system, pharmacy ordering and medication scheduling system, and accounting and administrative programs. The company markets nationally to over 50 hospitals and 125 terminals. Each hospital customer uses its own file.	Central supply, dietary, surgery, therapies, and clinical investigation subsystems will be designed and implemented, lab equipment will be automated using the IBM System 7.
Medical Information, Inc. 6011 Harry Hines Blvd. South Western Medical Ctr. Dallas, Texas	E. L. Kirklen Marketing	Medical Information serves 38 hospitals in Texas, Oklahoma, and New Mexico. Operational applications are inpatient and outpatient billing, accounts receivable, payroll, and general ledger. The service entails 09 batch mode processing using IBM 1050 terminals at the hospitals and two IBM 360/40 computers at the central location in Dallas, Texas. All information is transmitted via dedicated telephone lines. Current system cost is approximately $1.00 per patient day including all applications, terminal equipment, and line costs. An educational system is maintained for users and is essential to operating the data processing system.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Medicus Corporation 1104 Expressway Tower Dallas, Texas 75206	Allen S. Grier	The Medicus Corp. is currently involved in the design of hospital systems including business office management and laboratory information systems using the BSL Clin Data System and IBM 360/30/40/1800 computers. The Medicus Corp. is currently developing a total medical information system for individual as well as multiple uses.	Projected subsystems include all patient care areas.
Mediquip Corporation 205 Touchy Ave. Parkridge, Ill. 60068	David W. Lindsay Regional Sales Manager	Mediquip provides an automated diagnostic physiological laboratory examination system with multiple testing stations. This modular system has built-in expansion capability. No special wiring or other hook-ups are needed since all the systems will plug into a standard 115 volt, 60 cycle electrical outlet. A basic system, consisting of one physiological measurement console, one centerex (hearing/vision console), two interexes (automated history takers), and one computer, can process three patients per hour. It will cost $159,500 or can be leased for $4,659 per month including all maintenance, parts, and labor. The average cost per patient, at a rate of 24 patients per day, is $8.80. The system is currently installed in: Desplains, Ill.; West Side VA Hospital, Chicago, Ill.; Doctors' Hospital, San Diego, Calif.; and Rouge Valley Hospital, Medford, Oregon.	None Available

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Medlab Computer Services 5308 E. South Street Salt Lake City, Utah 84102	Dr. Gerald L. Davey	Medlab has software available on the Control Data 1700 Computer for subsystems including heart catheterization, pre-admission screening, intensive care monitoring, pulmonary care unit monitoring, operational monitoring, and the chemistry lab. These real-time computer systems use the CRT terminal, the 40-lines-per-second printer, the teletype terminal, and the IBM selectric typewriters.	Subsystems development, such as medical records, blood bank, pharmacy, and patient accounting.
RCA Cherry Hill, N. J.	Dennis Lucas, Manager Medical Marketing	RCA is marketing hardware called H.H.A.P., that can provide accounting and administrative systems, payroll, personnel, and scheduling. RCA also has a laboratory information system which is batch-oriented and capable of EKG analysis. The RCA main-frame configuration in hospitals normally consists of RCA Model 2 with 65K memory or the RCA Model 6 with 262K of memory. RCA hospital systems use the real-time concept and teletype CRT or other remote input hardware.	A total laboratory information system with on-line instrumentation. A total hospital information system, including pharmacy, dietary, business systems, and patient care, which will be offered on a time-shared area-wide basis.
Anthony J. J. Rourke, Inc. Hospital Consultants 26 Overlook Circle New Rochelle, N.Y. 10804	Donald R. Benson, V. P.	Hospital computer consulting on various stages of computer use and application development is provided to numerous hospitals.	None

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Sanders Associates, Inc. Daniel Webster Highway South Nashua, N.H. 03060	Edwin A. Gaskell Management Systems	The Sanders CLINI-CALL hospital data management system can be readily interfaced with computers such as those of Univac, IBM, NCR, Control Data Corporation, and many others which can store large amounts of data. The system provides real-time communications on an interdepartmental basis using the Sanders CRT terminal with photopen. The system also uses the Sanders Association FOPS (file-oriented programming system), which reduces the need of typewriter keyboard input by as much as 85 percent. Inpatient and laboratory records can be stored in the disc file for real-time retrieval and access. The system is completely modular; it can be installed with as few as eight terminals and can expand to 32 terminals without modification of the software or hardware configuration. Rearrangement of the computers and associated memories will allow expansion to 128 terminals. The minimum system configuration would cost approximately $200,000 installed.	Total hospital information management system

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Shared Medical Systems 650 Park Avenue King of Prussia, Pa. 19406	John Marshall, V. P.	This professional company provides hospital communities with on-line data processing services for patient billing, accounts receivable, the general ledger and financial reporting system, the cost allocation system, the financial responsibility and budget control system, the payroll/personnel system, accounts payable, fixed asset accounting, inventory, clinical data processing, medical records, and EKG analysis. An IBM 1050 terminal normally located in a business office or admissions area is interfaced with the IBM 370/155 Computer.	Unknown
Spectra Medical Systems, Inc. 1121 San Antonio Road Palo Alto, Calif. 94303	W. E. Chapman, III, M.D. President	Spectra Medical Systems is designing a medical information subsystem for a "physician acceptable" total hospital information system. Medical information subsystems presently installed include pharmacy, lab, admissions, medical orders, nursing inputs, lab inputs, inventory control, active orders maintenance, patient billing, dietary, radiology, pathology, activity reports, certain areas of central inhalation therapy, physical therapy, and EKG. The Spectra System is a real-time system, using color-video terminals with attached light pen and keyboard manufactured by Computer Communication, Inc. A 300-line-per-minute electric printer is attached to the video terminals which are used at all hospital locations.	Projected subsystems include automated histories, computer aided diagnostic histories, and certain office business systems.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: HOSPITAL INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Symbionics Systems, Ltd. 550 Berry Street Winnipeg 21 Manitoba, Canada	B.A. Hodson President	The SOLIS provides a problem-oriented programming language for real-time automated hospital information systems. Communication is via CRT systems. The software is written in FORTRAN and is applicable to IBM 360 and Control Data Corporation 6500 computers. The system has also been converted to the French ICL 1903A and 1904E. It can be placed on any computer of sufficient size similar to the IBM 360/40 series. No systems are currently installed.	Totally automated hospital information system using CRT video screen input-output devices. Symbionics has a joint margin arrangement with RCA for hospital information systems.
Technicon Medical Information Systems, Inc. (Subsidiary of Technicon, Inc.) 590 E. Middle Rd. Mountain View, Calif. 94085	Clinton T. Eldridge Manager	Technicon provides a totally automated medical information subsystem using the IBM 360/40 and 360/50 main frame computers with radial terminals at all nursing stations, laboratory, radiology, pharmacy, and EKG/EEG departments. The following subsystems are in prototype operation at El Camino Hospital in Mountain View, California: physician, nursing, laboratory, radiology, medical records, pharmacy, admissions, EKG/EEG, pulmonary medicine, physical medicine, respiratory therapy, and food service/dietary. Hospital accounting services are also provided to several hospitals throughout the country. (Formerly Lockheed Medical Information Systems.)	All subsystems will be implemented at new hospitals in the next few years.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Computer Instruments Corp. 92 Madison Avenue Hempstead, N. Y. 11550	John Kristoffersen Sales Manager Medical Electronics Divison	Computer Instruments markets the necessary electronic equipment for real-time transmission of EKG data. The dat-ek unit acquisitions EKGs for computer processing. The dat-ek has self-contained tape storage leads and patient identification. The tel-ek receiver receives and displays EKGs which have been transmitted over conventional or data phone lines. In addition to the standard strip chart type receiver, Computer Instruments also manufactures FM magnetic tape deck receivers. The tel-ek transmitter, receiver, and casset tape deck cost approximately $4,500 each. The minimum tel-ek configuration can be purchased for $1,675 each.	Unknown
Dictation, Inc. 3654 Henderson Blvd. Tampa, Fla. 33609	Lewis E. Wells President	Telephone dictation is transcribed on a 24-hours-per-day basis. Complete word processing of all medical record reports is provided. Charges are $6.00 per 1,000 words transcribed. Over-night air mail service of transcribed material is provided to most cities in the United States. As much as $3.94 per 1,000 words transcribed can be saved over conventional in-house transcription.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
The Standard Register Company Dayton, Ohio 45401	E.W. McCalley National Coordinator Hospital Market Industry Marketing	Standard Register's line of source record punch devices provides data collection devices specifically built for the hospital market and currently used by over 200 hospitals. The system can use pre-punched and embossed plastic cards as the source data entry point for automated information systems. These devices are marketed with complete support in terms of design of forms needed and assistance in planning the models to be applied. Standard Register also maintains a nationwide service organization.	Unknown
Telautograph Corp. 8700 Bellanca Ave. Los Angeles, Calif. 90045	David M. Swerdlin Marketing Services Dept.	Telautograph has a device for instantly transmitting handwritten material to an unattended receiving device. It is often used to transmit a request for medical records from an outpatient department admitting office to the medical records department. The transcriber may be leased for $30 per month including maintenance, or purchased for $1,250 with maintenance provided at additional cost. Existing telephone lines or 22 gage copper wires are used to connect each transcriber with a transceiver. The system is installed in more than eighty hospitals nationwide.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: COMMUNICATION SYSTEM

Company	Point of Contact	Current Product or Systems	Future Products
Teletracer International Corporation 42-25 27th St. Long Island City, N.Y. 11101	Leon Levy National Sales Manager	Teletracer provides a wide variety of wireless communication devices used for pocket paging, nurse call, remote television, doctor's register, intercom and closed circuit television. Systems can be designed for communication between the outpatient department and admissions and between nursing units and the medical records department. The system costs from several hundred to several thousand dollars, depending upon the system's complexity.	Unknown
Victor Comptometer Corporation 3900 N. Rockwell St. Chicago, Ill. 60618	Herbert R. Harges Manager, Market Development	The electro-writer provides facsimile transmission of a written message between two points with a transceiver or transmitter and a receiver device. The system is currently used between any two points within a hospital, such as the medical records department and the emergency room, the medical records department and the nursing unit, or the medical records department and the meeting office.	

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: LABORATORY INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Bio-Chemical Procedures 12020 Chandler Blvd. North Hollywood, Calif. 91607	Carl Schenk	Computer services are provided primarily in the chemical laboratory processing, reporting, and billing areas. Also provided is a short-form preparation practice management report with patient billing. These systems use the PDP-12 clinical laboratory data acquisition system and the IBM 360/40 System with teletype and on-line transmission between satellite laboratories and clients.	Unknown
Bio-Logics, Inc. 1 Research Rd. Salt Lake City, Utah 84112	Spencer M. Ure	Bio-Logics provides a clinical laboratory computer that may be accessed by any hospital's central processor for medical record processes. The Data General "Nova" computer is used. All test inputs, either manual or on-line, will be identified using the Bio-Logics costing identification program. Inputs are by the mark sense/punch card reader, teletype, and keyboard graphics systems. The processing system helps ensure positive identification in addition to serving in classical hospital applications.	Separate satellite computers are planned for use in radiology, admissions, and other data source centers with on-line input to a mass storage center.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: LABORATORY INFORMATION SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Laboratory Computing Inc. 4915 Monona Drive Madison, Wis. 53716	G. Philip Hicks, Ph.D. President	Laboratory systems using the PDP-12 and Linc 8 computers with teletype and cathode ray screen input devices are currently available. They have up to 12 terminals and 24 instrument channels with a 2,000 patient data file.	Unknown

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: MICROFILM SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Arcata Microfilm 740 Chatham Rd. Winston-Salem, N.C. 27103	David B. Carmichael General Manager	The main service provided to hospitals is the filming or microfilming of retired medical records. Arcata also provides microfilm viewing devices through a subsidiary known as the Atlantic Corporation and the Hospital Microfilming Company. The various divisions provide complete microfilm processing including strip, microfilm, and microfiche, using COM (Computer-output-microfilm).	Unknown
Eastman Kodak Corp. 2857 Banksville Rd. Pittsburgh, Pa. Home Office: Rochester, New York 14650	D.B. Perkins District Sales Manager	Eastman Kodak carries a full line of microfilm processing, storage, retrieval, and display systems. Microfilm format includes the roll magazine, microfilm, microfiche, and microstrip.	Unknown

PROVIDERS OF MEDICAL RECORDS

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: MICROFILM SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Mosler Information Systems 40 W. 40th St. New York, New York 10018	Joseph A. Kerr Assistant Director of Marketing	The Mosler System 410 is an automated microfilm storage and retrieval system, using computer hardware such as an IBM 360/40, Varian 6201, Westinghouse 2550, or GE 4225. Microfiche documents can be retrieved on a real-time basis; access time averages less than ten seconds. The time-sharing feature allows multiple users to share a common or multiple data base. Remote access through high resolution closed circuit TV, as well as a through a multitude of other output devices is possible. The system's capacity is 200,000 microfiche per storage module. The system is presently installed in the University of Missouri Medical Center, using closed circuit TV output for medical abstracts. Future applications are designed for patient records at other locations.	Storage and retrieval of x-rays and other documents which can be stored on microfilm.

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: FILING SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
The Smead Manufacturing Company 600 E. Tenth St. Hastings, Minn. 55033	T.P. Mayer	A full line of manual file systems is available, including terminal digit file folders with color codes and pre-numbered carrying schemes, file shelving, file dividers, and file inserts.	Unknown
Supreme Equipment and Systems Corp. 170 53rd St. Brooklyn, N.Y. 11232	I.L. Moss, Vice Pres. Sales	The roll-out Conserve-All file is the basic manual filing system. The CONSERV-A-TRIEVE is an electronic hard-copy, high security filing system. It has an electronically controlled conveyer with a picker that moves horizontally and vertically between facing banks of optically coded modules in which individual metal file boxes are stored. Upon a signal from a central keyboard, the desired metal file box is extracted and moved to the work station for filing operations. An electronic stand-alone disc memory with cathode ray terminals, sold under a trade name of Recall I, is also available. This filing system can be integrated with any system to provide high-speed cross-reference between account name and account number.	Unknown

PROVIDERS OF MEDICAL RECORD

SUPPORT SYSTEMS AND HARDWARE (cont.)

PRODUCT TYPE: FILING SYSTEMS

Company	Point of Contact	Current Product or Systems	Future Products
Visirecords, Division of Berry Right Corporation, Copiague, Long Island, N.Y. 11726	Joel J. Shulman Manager, Marketing Services	Visirecords provides shelving and forms specifically designed for hospital records, stock maintenance, preventive maintenance, and appointment systems. Systems are also available for the proper storage and use of computer input media as well as for manually assisting computer-type record maintenance. Current products include barrel type card file systems for cross-reference, heavy access files, tray units, insulated safe units, open trays, work tables, strip files, card files, file tables, drawer files, and shelf files.	Unknown

3.4 MANUFACTURERS NOT RESPONDING TO THE STATE-OF-THE-ART SURVEY

Central Bank Computer Bureau 1527 Webster Street Oakland, California 94612 Jack Dunn	Hospital shared data processing services
Compucare, Inc. 8550 W. Bryn Mawr Chicago, Illinois 60631 Peter J. Marsh	Development and operation of information systems exclusively for hospitals
DeJur Amsco Corporation Northern Blvd. & 45th St. Long Island City, N.Y. 11101 Len Hayes	Complete combination dictating/transcribing systems
DMS Computer Industries, Inc. 661 Palisade Avenue Englewood Cliffs, N.J. 07632 Joseph A. Geraghty	Hospital accounting systems
DuKane Corporation 103 N. Eleventh Avenue St. Charles, Ill. 60174 Frank Johnson	Complete line of communications systems for hospitals
Edstan Automatic Registrars 2956 Rubidoux Blvd. Riverside, Calif. 92509 David Verner	Bed status systems
Honeywell, Inc. Electronic Data Processing Div. 60 Walnut Street Wellesley Hills, Mass. 02181 Maurice I. O'Connell	Computer systems with hospital community health care programs
Information Management Technology, Inc. 912 Third Avenue, South Fargo, North Dakota 58102 Charles Hill	Hospital computer accounting and information services
Infotronics Corporation Houston, Texas	Lab Systems

Magnavox Systems , Inc. Park 80 E., Parkway at Interstate 80 Saddle Brook, New Jersey 17662 W. R. Bigger	Telecommunications
Mead Johnson Medical Services, Inc. 2402 Pennsylvania Avenue Evansville, Indiana 47721 Donald O. Hoefling	MD Systems offering a complete physician billing system and insurance form preparation.
Medelco, Inc. 200 E. Irving Park Rd. Wood Dale, Ill. 60191 R. T. Roeser	Total Hospital Information System (T.H.I.S.)
Moore Business Forms, Inc. 1100 Interstate Hwy. 35 E S. Denton, Texas 76201 Eldon Wiese	Our Transcorder System M-100.
Motorola Institutional Electronics 4545 W. Augusta Blvd. Chicago, Illinois 60651 Al Schmid	Electronic management systems
Philips Business Systems, Inc. (A North American Philips Co.) 100 E. 42nd Street New York, New York 10017 Hank Griffen	Norelco Medical Dictation System
Physicians' Record Company 3000 S. Ridgeland Avenue Berwyn, Illinois 60402 Ron Kuchta	Medical record and department requisition and charge slips
Raytheon Company 141 Spring Street Lexington, Mass. 02173 Hugh Bannon	Data-Select hospital information system
Records Handling Systems 1680 River Road Des Plaines, Illinois 60018 Bernard S. Black	Patient chart holders and chart dividers for the hospital nursing station
Wells Television, Inc. 251 Park Avenue South New York, New York 10010 H. Scher	WELLPLEX system with surveillance, nurse-view, closed circuit, and color

CHAPTER 4

PROPONENTS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS

4.1 INTRODUCTION

The following matrix summarizes the results of a questionnaire sent to personnel we could identify as having made a major contribution to automated information systems. The list, of course, is not exhaustive. Questionnaire recipients were asked to list currently automated sub-systems, real-time computer input devices and their locations, files shared by multiple users, the mainframe computer used, and additional systems planned over the next five years. Section 4.2 lists individuals and institutions not responding to the questionnaire. These individuals and their addresses are given so that our list of proponents of automated medical record systems would be complete and anyone wanting additional information could contact them directly.

4.2 PROPONENTS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned Over Five Years	Remarks
Prof. Sixten Abrahamsson Göteborg University Medicinaregatan 9 S-400 33 Göteborg Sweden	Patient administration (admission, waiting list), and chemical laboratory, bacteriological laboratory, and booking systems.	CRT terminals with hard copy facility are used throughout. By the end of 1972 there will be over 100 CRTs.	Direct access file (1.5 million people) shared by all medical users in the greater Stockholm area. Each hospital has separate "active" patient files in the central computer.	2 Univac 494, 131K + 65K. (1 word = 5 characters).	Most hospital functions suitable for computerized operation.	The Danderyd system (1,000 beds) will be incorporated into the new Huddinge Hospital (eventually 1,600 beds) in March 1972. It will then be extended to include all major hospitals in the region. Already a few functions, for example, waiting lists, are used on the regional level.
C. H. Altshuler, M.D. Pathologist St. Joseph's Hospital 5000 W. Chambers St. Milwaukee, Wisc. 53210	Laboratory.	Teletype Model 33.	None at this time.	Clas 300 Computer, 16K.	Total hospital information system using CRTs as physician input/output device.	The Clas Laboratory data processing system has been expanded to include the PALI (Programmed Accelerated Laboratory Investigation) and the SLIC (Selective Laboratory Information Center) Systems to improve clinical diagnosis.
Robert L. Baker Texas Institute for Rehabilitation and Research The Texas Medical Center Houston, Texas 77025	Admissions/discharge, inpatient care scheduling, pulmonary functions testing, blood gas analysis, and disability profile.	CRT in main nursing station, medical records, clinical laboratory, cardio-pulmonary laboratory, physical therapy, occupational therapy, admitting office, and scheduling office. Typewriter in scheduling office, admitting, computer applications office, and main nursing station.	All on-line data is stored in a file accessible from every terminal (if permitted).	IBM 360/50, 1,128K.	Urology clinic reports, outpatient appointment scheduling, patient financial clearance, inhalation therapy, and pharmacy.	
G. Octo Barnett, M.D. Laboratory of Computer Science Massachusetts General Hospital Boston, Mass. 02114	Clinical laboratory, automated medical history, ambulatory medical record system, and physician advisor.	Teletype and CRT in chemistry, bacteriology, medical record room, and OPD. High speed printer in chemistry and bacteriology.	All files.	DEC PDP-9, 32K (3 parallel machines).	Pharmacy (doctor's orders), physician entry of narrative notes, radiology scheduling and reporting system, and tumor registry.	Special language, MUMPS, has been very valuable. MUMPS and application programs are now marketed by several time-sharing bureaus and by DEC and are used by 10 to 12 other hospitals.
Walter L. Bennett Senior Systems Engineer The Institute of Living Hartford, Conn. 06106	Master patient record and logistics of patient care (admissions, transfers, discharges, diagnoses, medical orders, nursing notes, doctor notes, and others).	Bunker-Ramo CRTs, teletypes, typographs, Cal-Comp plotter (pharmacy, d.p., psycho-physio lab, admissions, nursing supervisors, and medical records).	Master patient record, personnel file.	IBM 1440, 16K, Line-8; DEC PDP-15, 24K.	Extension of current systems as greater capability (hardware) is installed.	

PROPONENTS OF AUTOMATED MEDICAL RECORD AND HOSPITAL INFORMATION SYSTEMS (CONT.)

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned over Five Years	Remarks
Marsden S. Blois, M.D. University of California San Francisco Medical Center Medical Information Systems San Francisco, Calif. 94122	An advanced clinical laboratory reporting system.			Probably a network of mini-computers rather than a single large computer.	Bacteriology lab reporting, cytology reporting, diagnostic radiology reporting, admissions and discharge, and pharmacy systems.	
Jerome Boyer Conemaugh Valley Memorial Hospital Johnstown, Pa. 15905	Laboratory only.	Analog signals from automated chemistry and Coulter S. Five teletypes in lab.	None.	PDP 12, 8K with 500K word disk.	Patient records.	
Kenneth Brenner Director of Operational Services Lutheran General Hospital 1775 Dempster St. Park Ridge, Illinois 60068	Lab -- DNA Computer.	None.	None.	Honeywell 1250.	Total information system.	
Salvatore Cerruto Director, Records Information Kings County Hospital Center Clarkson Avenue Brooklyn, New York 11203	Ampex Corporation will install a video-file system linking 30 or more record areas to a central video tape file. Outpatient and inpatient records will be available on CRTs and in hard copy.	None.	None.	Ampex Systems Controller. 40K	None.	The Ampex System is a computer-controlled video tape access device.
John M. DeGroot Assistant Director for Electronic Data Processing Missouri Regional Medical Program Columbia, Missouri 65201	"Automated Physician's Assistant" components including automated patient history, automated EKG, radiology reporting system, FACT Bank information retrieval system, automated blood pressure, and management information system for fiscal management of grants.	IBM 2260 CRT, facsimile transmitter, and teletype.		IBM 360/50, 512K; XDS Sigma 3, 32K.		
James L. Delong, Admin. Bess Kaiser Hospital 5055 North Greeley Avenue Portland, Oregon 97217	Health plan membership file, purchasing, inventory, accounting, and payroll systems.	None.	None.	Leased time from service bureau, IBM 360/30	Total hospital information system (MIS).	Merwyn Greenlich, Ph.D., Director of Research, is developing new software.

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned over Five Years	Remarks
Paul R. Finley, M.D. Clinical Pathologist Fairview Hospital 2312 South 6th St. Minneapolis, Minn. 55406	14 systems in three hospitals.	Teletype in pharmacy.	All files within system.	Univac 9400.	Total HIS.	System in lab is essentially electronic data processing.
John W. Foft, M.D. Chairman, Department of Clinical Pathology University of Alabama Medical Center 619 South 19th St. Birmingham, Ala. 35233	Clinical laboratory reporting system.			IBM 360/50, 512K; IBM 1130, 8K (laboratory).		
Richard K. C. Hsieh Chief, Health Services Research USPHS Hospital 3100 Wyman Park Drive Baltimore, Maryland 21211	Berkeley Scientific Laboratory CLINDATA System (lab), health evaluation center (multi-phasic testing), inpatient medical information system.	SMA-12/20 Autoanalyzer (lab).	Laboratory and medication files.	PDP-8 CPU; 3 CDC 1700 CPU; 1 CDC 915 Optical Page Reader.	Admissions, inventory, and supply systems.	
J. Paul Morris Associate Administrator Monmouth Medical Center Long Branch, New Jersey 07740	Laboratory, radiology, pharmacy, central supply ordering, nursing instructions, admissions, and dietary.	IBM 1092 and 1093 programmed keyboards and 1052 typewriters.	Patient data file.	IBM 360/40, 128K, 2413 with 5 drives, two 2401 tape drives, under DOS.	On-line unit for medical records, ambulatory patient services, laboratory and radiology results reporting, O.R. nursing station, and miscellaneous ancillary services such as EKG, EEG, EEG, inhalation therapy, and rehabilitation.	Because of local conditions the 1092s and 1093s are in a "pool" available to the nursing stations via dedicated telephone lines. The 1053 printer is at the nursing station. The economics of using CRTS at the nursing units are being explored. There are 1092s and 1093s and 1052s in the laboratory, radiology, pharmacy, central supply, dietary, and admissions.
Charles K. Nagy, M.D. Director of Computer Center University Hospital 750 Harrison Avenue Boston, Mass. 02118	Medical Information System which stores, maintains, and retrieves administrative and medical information on all patients.	None at present.	Patient billing file and payroll-personnel file.	IBM 360/40, 65K to be increased soon to 131K.	Possibly on-line admissions, laboratory automation, and pharmacy.	
Jan Polissar, M.D. Automation Consultant 8501 Rayburn Rd. Bethesda, Maryland 20034 (301) 530-5903	Automated disease and operation index system. When the discharge summary of diseases and operations is typed, the information is captured on magnetic tape and computer processed to produce a D&O index with many new features.	None.		CDC 3200 and IBM 360/65.		

Person to Contact	Current Subsystems	Real-Time Computer Input Device and Location	Files Shared by Multiple Users	Mainframe Computer	Systems Planned Over Five Years	Remarks
PROMIS Laboratory Mary Fletcher Unit Adams Residence Burlington, Vermont 05401 (802) 864-7441	The total Problem-Oriented Medical Record (including all narrative and numeric data, present illnesses, progress notes, and flowsheets) on a general medical ward and GYN ward. Operational since July, 1970.	3-Digiscribe (touch sensitive screen), CRTs (CDC 211) on ward. 1-Digiscribe CRT (COMPUTEK 100) in doctor's office in Maine over phone lines (4800 bps).	Display library of the structured branching logic diaplays used to generate and retrieve all narrative and numeric data. Patient's structured medical record file.	Two CDC 1700s with 32K-- one on-line, one developmental. Each configuration has: 5-854 disks (7.2 x 10^6 characters), 1742 printer, 2-609 (9 track 1800 BPI) tape units, 1745-1 display controller with 7-211 CRT Digiscribe terminals (only on one system), QSE Data Set Multiplexor with CDC 3180 Digiscribe terminals and COMPUTEK 100 terminals (also with the Digiscribe attachment).	System will first expand to supporting areas of one ward. Then ward-by-ward expansion will begin for the total hospital.	
Allan Pryor Latter Day Saints Hospital Salt Lake City, Utah 84103	Lab, multiphasic screening, intensive care records, and coding of diseases.	Beehive terminals and data sets give access to every room in the hospital.	Patient data files -- medical records.	CDC 3300, 32K.	Complete medical record.	
Anthony J.J. Rourke, M.D. Special Assistant to the Director Building 10, Room 1N-222 National Institutes of Health Bethesda, Maryland 20014 (301) 496-2773	Laboratory, medical record discharge diagnosis file, anatomic pathology diagnosis file.	IBM 2741 terminals in medical records, nursing, clinical pathology, and administration.	Within the next year, we expect to have clinical pathology files, medical record discharge diagnosis files, anatomic pathology files, and admissions-bed census files on line and integrated.	CDC 3200, 32K; IBM 360/65, 1.5MK x 2; IBM 360/50, 512K x 2.	Admissions, pharmacy, clinical bacteriology, clinical serology, outpatient scheduling, and physician's order and facility scheduling in inpatient and outpatient areas.	

4.3 INDIVIDUALS NOT RESPONDING TO THE QUESTIONNAIRE

Individuals and institutions not responding to our questionnaire are listed alphabetically by area of interest: hospital information systems, laboratory information systems, and medical records. The specific interest of each contract is listed in the right-hand column.

4.3.1 Hospital Information Systems (HIS)

James M. Anthony, Jr. Daughters of Charity Hospitals, Northeast Jamaica Estates, New York	HIS
Mrs. Marion Ball Assistant Director, Medical Computing Activities Temple University Philadelphia, Pennsylvania 19140	HIS
George J. Bartel Administrator Monmouth Medical Center Monmouth, New Jersey	HIS
Glenn H. Clark University of Tennessee School of Medicine Memphis, Tennessee	HIS
L. W. Cronkhite Children's Hospital Medical Center Boston, Massachusetts	HIS
John Donnelly, M.D. Institute of Living 400 Washington Street Hartford, Connecticut 06108	HIS
Charles D. Flagle The Johns Hopkins University Baltimore, Maryland	HIS Evaluation Methods
Walter S. Flynn Controller David Weiss Convalescent Hospitals Los Angeles, California	Small Hospital Computer Systems

E. R. Gabrieli, M. D. Director Clinical Pathology and Clinical Infor- mation Center E.J. Meyer Memorial Hospital Buffalo, New York	HIS
Bernard C. Gluech Institute of Living Hartford, Connecticut	HIS
The Herner Company Hospital Automation Project 2431 K Street, N.W. Washington, D.C. 20037	HIS Consultant
Walter S. Huff, Jr. Sisters of 3rd Order of St. Francis Peoria, Illinois	HIS
Harry O. Humbert Associate Vice President The Roosevelt Hospital New York, New York	HIS
Goeffrey G. Jackson Assistant Director Peter Bent Brigham Hospital Boston, Massuchesetts	HIS Costs
Raymond B. Lake Memorial Hospital of Long Beach Long Beach, California	HIS
Dr. A. B. Lindberg University of Missouri Columbia, Missouri	HIS
E. W. McCalley Special Markets Manager The Standard Register Company Dayton, Ohio	Input Devices
Mr. J. R. Petters Computer Applications Group Eugene Wuestoff Memorial Hospital P.O. Box 6 Rockledge, Florida 32955	HIS

J. E. Schenthal Tulane University New Orleans, Louisiana	HIS
J. Peter Singer Associate Arthur Young & Company San Francisco, California	HIS Consultant
Warner Slack University of Wisconsin School of Medicine Madison, Wisconsin	HIS
William A. Spencer, M.D. Texas Institute of Rehabilitation and Research Houston, Texas	HIS
James W. Sweeney, Ph.D. Director, Computing Centers University of Oklahoma Norman, Oklahoma	Management Information Systems
Carlos Vallbona M.D. Department of Community Medicine Baylor College of Medicine Houston, Texas	Shared HIS
Edmund E. VanBrunt, M.D. Medical Data Systems Kaiser Foundation Research Institute Oakland, California	HIS
Kenneth Walz Administrator Saginaw General Hospital Saginaw, Michigan	HIS
Dr. L. L. Weed University of Vermont School of Medicine Burlington, Vermont	HIS

4.3.2 Laboratory Information Systems

Howard Abrahamson Fairview-Southdale Hospital Minneapolis, Minnesota	Lab Systems
Central Pathology Laboratories Sacramento, California 96819	Lab Systems
Centralized Laboratory Long Island, New York	Lab Systems
Thomas C. Chapman Clinical Research Center National Institutes of Health 9000 Wisconsin Avenue Bethesda, Maryland 20014	Lab Systems
Clinical Laboratories St. Louis, Missouri 63110	Lab Systems
Vance C. Demong North Memorial Hospital 3320 Lowry Avenue Minneapolis, Minnesota 55422	Lab Systems
Nelson F. Evans University Hospital 750 Harrison Avenue Boston, Massachusetts 02118	Lab Systems
Dr. P. R. Finley Fair View Hospital 2312 S. Sixth Street Minneapolis, Minnesota 55409	Lab Systems
Fred K. Fish Nassau Hospital Mineola, New York 11501	Lab Systems
Dr. S. A. Goldblatt Conemaugh Valley Memorial Hospital Johnstown, Pennsylvania 15905	Lab Systems
Dr. Phillip Heiks University of Wisconsin Hospital 1300 University Avenue Madison, Wisconsin 53706	Lab Systems

Edwin J. Hinman USPHS Hospital 3100 Wyman Park Drive Baltimore, Maryland 21211	Lab Systems
Harold H. Hixson University of California Hospital 3rd and Parnassus San Francisco, California 94122	Lab Systems
John H. King University of Tennessee Hospital 1924 Alcoa Highway Memphis, Tennessee 37920	Lab Systems
William Kreykes Hennipen County Hospital 5th and Portland Streets Minneapolis, Minnesota 55415	Lab Systems
Lakey Clinic Boston, Massachusetts 02210	Lab Systems
Sr. Mary Laureen St. Vincent Hospital 2447 N. W. Westover Road Portland, Oregon 97210	Lab Systems
Moses Cone Hospital Greensboro, North Carolina	Lab Systems
Sr. Agnes Marie Paul Saint Francis Hospital 929 N. St. Francis Avenue Wichita, Kansas 67214	Lab Systems
Dr. Hugo C. Pribor, M. D. Institute of Laboratory Medicine Perth Amboy General Hospital Perth Amboy, New Jersey	Lab Systems
Swedish Hospital Seattle, Washington	Lab Systems

Dr. Arthur E. Rappoport, M. D. Director of Laboratories Youngstown Hospital Association Youngstown, Ohio	Lay Systems
Sherwood D. Smith Lakeland General Hospital Lakeland, Florida 33802	Lab Systems
Frederick B. Sperry St. Louis City Hospital 1515 Lafayette Avenue Saint Louis, Missouri 63104	Lab Systems
Dr. J. U. Straumfjord University of Alabama Hospital 619 19th Street Birmingham, Alabama 35233	Lab Systems
Mr. Gail L. Warden St. Luke's Presbyterian Hospital 1253 W. Congress Chicago, Illinois 60612	Lab Systems
Charles B. Womer Yale-New Haven Hospital 789 Howard Avenue New Haven, Connecticut 06504	Lab Systems

4.3.3 Medical Record

Gordon M. Derzon Assistant Commissioner Kings County Hospital Center 481 Clarkson Avenue Brooklyn, New York 11203	Video File MR
Alvin R. Feinstein Yale University School of Medicine New Haven, Connecticut	Quality of MR Data
Burgess L. Gordon, M.D. American Medical Association Chicago, Illinois	MR Content

John L. Juergins, M. D. Joseph M. Kiely, M. D. Mayo Clinic Rochester, Minnesota	Computer- Based MR
James L. Muse Administrator Jess Parrish Memorial Hospital Titusville, Florida	MR Pages- on NCR System

4.3.4 Miscellaneous

James O. Beaumont Manager, Advanced Systems Development IBM Corporation San Francisco, California	Patient Monitoring
Grouer C. Bowles, Jr. Director of Pharmacy Baptist Memorial Hospital Memphis, Tennessee	Pharmacy Systems
Dr. Gerald L. Davey President Medlab Computer Systems Salt Lake City, Utah	Multiphasic Screening
Dr. Robert Feldman Permanente Medical Group Oakland, California	Multiphasic Screening
Mrs. Shirley A. Fish P.O. Box 311 Boston, Massachusetts	Medic Alert Foundation
J. Goldman, D. Sc. Chairman, Dept. of I. E. University of Missouri Columbia, Missouri 65201	Computer Scheduling
Dr. John B. Henry Director, Department of Pathology State University of New York Syracuse, New York	Multiphasic Screening

Robert H. Richart, Ph. D.
Department of Medical Methods Research
Kaiser Foundation Research Institute
Oakland, California

MIS
Evaluation
Methods

Thomas P. Weil, Ph. D.
Director
Graduate Studies in Health Science
University of Missouri
Columbia, Missouri 65201

Hospital
EED

CHAPTER 5

CURRENTLY FUNDED RECORD KEEPING PROJECTS

5.1 INTRODUCTION

The Science Information Exchange, the information retrieval service of the Smithsonian Institute, provides narrative descriptions of current research programs. In response to our request for information on hospital and health care facility record keeping, we were sent a list of programs, which we divided into 11 categories according to functional application within the realm of medical records and hospital information systems. These categories are:

- Chronic illness and rehabilitation
- Community-wide health care
- Diagnostics
- Hospital information systems
- Medical records and patient information
- Monitoring systems
- Pathological and laboratory data
- Patient population studies
- Pharmacy
- Psychiatry and mental health
- Records research.

For each program, the project title, principle investigator, recipient institution, and report summary are given. The report summary has been abstracted for this report.

5.2 CHRONIC ILLNESS AND REHABILITATION

Computer Recording of Clinical Data of Non-Operated Scoliotic Patients

Dr. P. R. Harrington

Baylor University
Medical Rehabilitation Research
and Training Center
P.O. Box 20095
Houston, Texas 77025

This project is to obtain, store, and statistically analyze clinical data of non-operated scoliotic patients.

Computer Recording of Clinical Data of Operated Scoliotic Patients

Dr. P. R. Harrington

Baylor University
Medical Rehabilitation Research
and Training Center
P.O. Box 20095
Houston, Texas 77025

This project is to develop a computer program for identifying, storing, and manipulating data obtained from operated scoliotic patients.

Demonstration of a Hospital Data Management System

Dr. W. A. Spencer

Texas Institute for Rehabilitation
and Research
1333 Moursund Avenue, Box 20095
Houston, Texas 77025

The hospital information system developed at the Texas Institute for Rehabilitation and Research will be extended to provide: (1) standardized care plans for specific chronic illnesses; (2) tailoring of the standard plans to the patient's own disability; (3) description of patient progress; (4) documentation of the chronology of complications; (5) automatic resolution of conflicts in scheduled care plans; and (6) refined estimates of hospitalization costs.

Extension of Simplified Coding System to Record Client Termination and Follow-Up Data

Dr. M. Tseng

West Virginia University
Vocational Rehabilitation Research
and Training Center
Institute, West Virginia 25112

This project is to determine what information on client completion of rehabilitation training are to be included in the coding format.

5.2 CHRONIC ILLNESS AND REHABILITATION (cont.)

Research Data Bank for the Research and Training Center

Dr. T. Gust

University of Pittsburgh
Vocational Rehabilitation Research and Training Center
16 Cathedral of Learning
Pittsburgh, Pennsylvania 15213

This project is to establish a data bank of rehabilitation client data for PRC and RT-14.

Sample Research Project on Computer Processing of Clinical Data

Dr. L. C. Vallbona

Baylor University
Medical Rehabilitation Research and Training Center
P. O. Box 20095
Houston, Texas 77025

This project is to develop a data processing system for clinical research data in the proposed stroke program.

5.3 COMMUNITY-WIDE HEALTH CARE

Improving Medical Care Functions of a Medical Center

Dr. J. A. Bryan

University of North Carolina
School of Medicine
Chapel Hill, North Carolina 27514

This project is concerned with describing the primary and continuing medical care delivered to outpatients in a teaching institution. A computerized information system is being developed for demographic and other data collected in an on-going study of the clinic population.

Research and Evaluation of a Community Health Program for Prepaid Family Health Care

Dr. I. S. Falk

Community Health Care Center
New Haven, Connecticut

This project aims to develop a method of determining the prevalence and characteristics of health insurance as well as a system for recording health insurance data.

5.3 COMMUNITY WIDE HEALTH CARE (cont.)

An Urban Comprehensive Health Care Information System

Mr. C. Foreman

Denver Department of Health and Hospitals
Denver, Colorado 80204

This program has developed the outlines of the Urban Comprehensive Health Care Information System for use in the city-wide, decentralized Neighborhood Health Program. During Phase I, completed in July, 1970, manual methods for handling patient medical records were improved and the Shared Hospital Accounting System and the Computerized Master Patient Index were implemented. Included in Phase II (this grant) will be programming and hardware costs for a Patient Activity Information System and a Health Care Scheduling System.

5.4 DIAGNOSTICS

Coding of Electrocardiograms on Data Cards for Rapid Retrieval

Dr. A. S. Gear

United States Veterans Administration Hospital
1201 Broad Rock Road
Richmond, Virginia 23219

Using a key punch card rapid retrieval system, this project established eight separate categories of EKG diagnosis and coded approximately 24,000 EKGs accordingly. The resulting card file will enable the staff to pull numerous EKGs based on a particular diagnosis and use them for comparative purposes.

Computer Classification of Pulmonary Disability

A. B. Ruffner

United States Army
Medical Research and Nutritional Laboratory
Denver, Colorado

This project is to design a system for classifying disability in patients with pulmonary diseases, and test it on a production basis.

5.4 DIAGNOSTICS (cont.)

Development of a Community Wide Health Information System to Assist in Maternal and Child Health Program Planning

Dr. E. Siker

Community Health Division
State Department of Health
165 Capitol Avenue
Hartford, Connecticut 06115

The Maternal and Child Health Information System developed in New Haven by the area linkage of census data, health survey data, vital records, and obstetrical records will be continued and expanded. The techniques developed will be tested by the Southern California Regional Information Study in Los Angeles.

Evaluation of Health Services in a Black, Poor-Core City Area

Dr. A. Haynes

National Medical Association
Foundation
Washington, D. C.

A health service research unit in the Shaw Urban Renewal Area of Washington, D. C., will: (1) develop a record system to provide data for studies of quantity, quality, and cost of services; (2) establish guidelines about selected community mortality; and (3) measure the effect of services in terms of cost, availability, community participation, and ability to attract local people to health careers.

Improvement of Methodology for Clinical Evaluations

Dr. A. R. Feinstein

Yale University
School of Medicine
333 Cedar Street
New Haven, Connecticut 06510

This project will assemble and analyze data on the clinical course and management of cancer and other degenerative diseases; construct improved taxonomic systems for classifying and storing data; clinically integrate computers into data management; and develop better methods for predicting prognosis, evaluating therapy, and administering therapeutic care. Additional diseases under consideration will be diabetes mellitus and arthritic disease.

5.4 DIAGNOSTICS (cont.)

Nuclear Medicine and Scanning – Computer Methodologies

J. H. Harmon

Oak Ridge Associated Universities
Oak Ridge, Tennessee 37830

The ORAU computer (IBM 1800) is being applied to the repetitive calculations necessary for statistical studies of standard laboratory procedures and to testing new approaches to medical research problems.

5.5 HOSPITAL INFORMATION SYSTEMS

Assimilation of Technological Change in a Hospital

Professor B. Goldstein

Rutgers -- The State University
School of Arts
Old Queens Building
New Brunswick, New Jersey 08903

This project is to determine the impact of a hospital-based computer-assisted medical information system on the hospital in general and on the nursing station in particular. Studies include how the new system should be introduced, how work at the nursing station should be reorganized, and how authority and administrative responsibilities should be adjusted.

Demonstration of a Shared Hospital Information System

W. S. Huff

Sisters of 3rd Order of St. Francis
700 N.E. Glen Oak Avenue
Peoria, Illinois 61603

This project is to demonstrate the usefulness of a regional hospital information system in relation to clerical workload, communications, and informational response.

Development of a Computer Based System for Data Storage and Retrieval

Dr. R. E. Mattews

University of Minnesota
School of Medicine
1305 Mayo
Minneapolis, Minnesota 55455

This project is to develop a computer-oriented system for storing and retrieving patient data, producing routine reports, and processing data for research. Demographic, diagnostic, and therapeutic coding data have been selected for initial input.

Hospital Computer Project

Dr. G. O. Barnett

Harvard University
Massachusetts General Hospital
Fruit Street
Boston, Massachusetts 02114

Using a time-shared remote-access computer system, this project is to develop several modules of a hospital information system including automated laboratory test reporting, computer-based medical records, automated medical histories, medication ordering, computer-assisted patient diagnosis and management, and entry of physician-generated progress notes.

Hospital Data System - Automated Retrieval for Improved Admissions and Utilization

Dr. C. Lebo

Presbyterian Hospital of the Pacific
Clay and Webster Streets
San Francisco, California 94115

This project is to develop an automated data retrieval system for utilization review and scheduling of hospital admissions.

Hospital Information Systems, Optical Input/Output Recording

R. Garrett

Tulane University of Louisana
Graduate School
New Orleans, Louisiana 70118

This project is to evaluate at least nine makes of visual input-output devices. Accuracy, reliability, compatibility, ease of operating, training requirements, and noise, sanitary, and safety factors will be considered.

Regional Computer Facility at the Texas Medical Center

Dr. R. T. Eastwood

Texas Medical Center, Inc.
Houston, Texas

The Common Research Computer Facility is a service-oriented computer center which provides a large-scale resource for medical, medically related, and life-science investigators. Support of library automation is planned, and the development of hospital information systems services is being investigated.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION

Ambulatory Scheduling - A Management Science Approach

Dr. J. F. Rockart

Lahey Clinic Foundation, Inc.
Boston, Massachusetts 02215

This project is to improve methods of scheduling patients through an ambulatory care group practice medical clinic in order to improve physician utilization and reduce patient waiting time.

Application of Computer Technique to the Cardiac Section of Children's Hospital of Pittsburgh

Dr. F. W. Baker

University of Pittsburgh
School of Medicine
M240 Scaife Hall
Pittsburgh, Pennsylvania 15213

This project is to establish a computerized diagnostic file for congenital cardiac anomalies. A pilot study is also planned on infants with transposition of the great arteries who have undergone balloon septostomy.

Computer Analysis of Narrative Clinical Data

Dr. J. Korein

New York University
School of Medicine
550 1st Avenue
New York, New York 10016

This project is to improve the quality and accessibility of narrative and numerical medical data. Variable-Field-Length formats allow data to be collected automatically in a computer-acceptable form as a by-product of the physician's dictation of routine reports, clinical research protocols, and hospital discharge summaries.

Computer Recording of Surgical Case Histories

Dr. H. B. Wheeler

United States Veterans Administration Hospital
1400 Veterans of Foreign Wars Pkwy.
Boston, Massachusetts 02132

This project is to study automated collection of surgical case histories using computer techniques.

5.6 MEDICAL RECORDS AND PATIENT INFORMATION

Computer Techniques in Patient Care

Dr. G. M. Clark

University of Tennessee
School of Medicine
62 S. Dunlap
Memphis, Tennessee 38103

Everything happening to a patient will be recorded, priced, and correlated so that record keeping, patient billing, cost accounting, inventory control, communications with other agencies, and relationship to outpatient care will be automatic by-products of the patient care program.

Continuation of the On-Going Self-Care and Patient Information System

Dr. N. Silberberg

University of Minnesota
Graduate School
322 Johnston Hall
Minneapolis, Minnesota 55455

A model for electronic retrieval of patient information is being developed.

Control of Operations by Scheduling Using Terminals

L. Cronkhite

Children's Hospital Medical Center
300 Longwood Avenue
Boston, Massachusetts 02115

This project is to develop computerized management skills for selected medical groups in the clinic areas. A structured medical record will be developed for each patient and will be maintained in an on-line computer file.

Demonstration of the Integration of Active Medical Records

Dr. R. E. Robinson

Wake Forest University
School of Medicine
Reynolda Station, Box 7323
Winston Salem, North Carolina 27103

Advanced natural language electronic data processing techniques are used to acquire and analyze the history, physical examination, progress notes, and other narrative information contained in the medical record. A clinical laboratory computer system processes on-line data obtained from multiple channel continuous flow analyzers and from the manual entry of test results from video

Demonstration of the Integration of Active Medical Records (cont.)

tape terminals. A digital data acquisition system handles clinical EKGs. The narrative text and laboratory data processing systems are being integrated with a medical center communications system.

An Electric Data-Processing System for Maternity Care

Dr. J. L. Burks

University of Chicago
School of Medicine
5801 S. Ellis Avenue
Chicago, Illinois 60637

This project will study whether electronic data processing can improve maternity care and pregnancy outcome. The project will monitor all routine and special laboratory tests of maternity patients; identify high risk patients; and provide on-line availability of patients' records, with predicted complications, management guidelines, and pertinent literature references.

An Experimental Approach to the Design of a New Medical Record

Dr. D. D. Kozoll

Hektoen Institute for Medical Research
Chicago, Illinois

This project is to develop an improved medical record, to survey techniques and equipment in the field of automatic information dissemination, and to devise a medical records system applicable to all health care institutions.

Federal Employee Health Program

R. Anderson

United States Department of Commerce
National Bureau of Standards
Washington, D. C. 20234

This project is to design and implement a complete information management system for health records in the Federal Employee Health Program.

Management Review Program

G. E. Schunior

American Hospital Association
840 N. Lake Shore Drive
Chicago, Illinois 60611

An in-depth management review of the medical records function is being conducted; a method for evaluating innovative hospital management programs is being developed.

Navy Environment -- Symposium to Provide Information for Improving Navy Medical Record Services

A. Paull

Decca Navigator Systems, Inc.
Houston, Texas 77027

The symposium will discuss the latest developments in the processing and analysis of patient data. Sessions will cover hardware, software, and applications of computers in the biomedical field, particularly the cardiovascular area.

Real Time Computer Services for Ambulatory Clinics

Dr. A. G. Jessiman

Peter Bent Brigham Hospital
721 Huntington Avenue
Boston, Massachusetts 02115

This project is to study the feasibility of implementing administrative aids for managing patient care such as automatically supplying relevant data for utilization review, physician workload, preventive medicine procedures, and diagnostic and therapeutic reminders.

Record Keeping for Evaluation of Cost Benefits of Ambulatory Health Services Provided Residents of Low Income Areas (Abbrev)

Dr. M. L. Ingbar

Cambridge Department of Health and Welfare
1493 Cambridge Street
Cambridge, Massachusetts 02139

This project is to develop a record-keeping system which can be used in a cost-benefit analysis of alternative ways of providing outpatient care to the urban disadvantaged in Cambridge, Massachusetts.

Study of Hospital Discharge Abstract Systems

Dr. K. L. White

Johns Hopkins University
School of Public Health
615 N. Wolfe
Baltimore, Maryland 21205

This project is to critically evaluate the major hospital discharge abstract systems in operation or under development in the United States, Canada, and Europe. Recommendations will be made for coordinating abstract systems in the United States, standardizing data analysis methods, and determining a basic model for reporting utilization.

Survey of Ambulatory Medical Care

Dr. A. J. Hampton

Lea Associates, Inc.
Ambler, Pennsylvania 19002

This project is to revise the patient record forms tested in the "Survey of Ambulatory Medical Care," work out the induction problems identified in that survey, and field test the results of the revisions.

Uniform Hospital Discharge Data - A Demonstration

J. M. Ensign

Health Services Foundation
Chicago, Illinois

The objective is to implement, on a small scale, a discharge data system filling the hospital's own record requirements and the third-party claim requirements, as well as providing much information needed by planning agencies to improve the quality of medical care and control rising hospital costs. The legal aspects of the uniform discharge data system will also be explored, and activities will be coordinated with the National Center for Health Statistics so data standards can be set.

5.7 MONITORING SYSTEMS

Automated Monitoring of Sick Infants

Dr. L. G. Veasy

University of Utah
Primary Children's Hospital
320 12th Avenue
Salt Lake City, Utah 84103

This project is to develop an automated system to monitor arterial blood gases and pH in acutely ill infants and to give a real time on-line display of results. A computerized record keeping system for monitored infants is being developed.

An In-Depth Evaluation of Medlab Patient Monitoring Systems

Dr. A. E. Wechsler

Arthur D. Little, Inc.
15 Acorn Park
Cambridge, Massachusetts 02140

This project is to evaluate the Medlab System at the Massachusetts General Hospital, Boston, Massachusetts, and the Patient Monitoring Facility at the University of Minnesota Hospital, Minneapolis, Minnesota. Studies on manpower utilization, cost effectiveness, quality of health care, and research and educational benefits are to be considered.

5.8 PATHOLOGY AND LABORATORY DATA

Automated Data Processing for Clinical Chemistry

Dr. G. Brecher

University of California
School of Medicine
551 Parnassus Avenue
San Francisco, California 94112

This project is to evaluate data input devices which can be used for entering laboratory results, such as teletype, key punched or mark-sensed cards, TV or CRT terminals, and the peripheral entry consoles developed under the initial grant.

Computer Applications in Blood Component (Platelet Therapy)

R. Hsieh

United States Department of Health, Education and Welfare
Public Health Service National Institutes of Health
Baltimore, Maryland

This project is to automate the storage and processing of platelet transfusion data. An IBM 7094 or an IBM 1401 is used, and programs are written in Fortran IV.

Computerized Program forReporting Results of Microbiology by a Laboratory Geographically Removed from Patient Care Area

V. M. Young

United States Department of Health, Education and Welfare
Public Health Service Hospital
3100 Wyman Park Drive
Baltimore, Maryland 21211

A computerized reporting system for microbiologic data supplies printed reports for the patient's medical file and punched data cards for permanent hospital records.

A Data System for Surgical Pathology

R. E. Robinson

Wake Forest University
School of Medicine
Reynolda Station, Box 7323
Winston Salem, North Carolina 27103

This project is to continue developing an economically feasible method for storing and retrieving a large volume of surgical pathology data, both current and accumulated.

The Development of Machine Coding of Surgical Pathology Using the IBM 360/65 Computer

Dr. J. E. Todd

United States Department of Health, Education and Welfare
Public Health Service
National Institutes of Health
Bethesda, Maryland 20014

The IBM 360/65 is used to create a data file for surgical pathology diagnoses.

5.8 PATHOLOGY AND LABORATORY DATA (cont.)

Use of Computer to Improve Clinical Laboratory

Dr. D. Seligson

Yale University
School of Medicine
333 Cedar Street
New Haven, Connecticut 06510

This project is using automatic equipment and a computer in an attempt to perform better, faster, and more economical analyses on smaller samples and to rapidly present data in a good format.

Use of Time-Sharing Computer Facilities for Correlating Clinical and Patient Data with Microbiologic Research Studies

Dr. G. D. Vermeulen

United States Department of Health, Education and Welfare
Public Health Service Hospital
3100 Wyman Park Drive
Baltimore, Maryland 21211

A time-sharing computer facility is being used to record and sort clinical laboratory data for use in microbiology laboratory studies.

5.9 PATIENT POPULATION

Clinical Registry for Data Pertaining to Upper Extremity Spasticity in the Stroke Patient

Dr. R. Braun

University of Southern California
School of Medicine
2025 Zonal Avenue
Los Angeles, California 90033

This project is to collect clinical data on stroke patients with a spastic upper extremity in order to establish norms of function, identify prognostic factors, conserve health manpower, and reduce rehabilitation time and cost.

A Computer-Oriented Data Processing System for Dental Clinical Trials

Dr. J. P. Carlos

United States Department of Health, Education and Welfare
Public Health Service
National Institutes of Health
Bethesda, Maryland 20014

This project is to develop a system for collecting and analyzing dental caries clinical trials using an NIH 360 computer system and a specially designed optical mark sense form.

5.9 PATIENT POPULATION (cont.)

Computer Treatment of Chronic Dialysis Information

Dr. F. K. Curtis

United States Veterans Administration Hospital
4435 Beacon Avenue, South
Seattle, Washington 98108

Raw clinical data on chronic dialysis will be computerized, and additional computer programs will be developed to make existing data readily available in summary form. Methods for assessing treatment costs will also be devised.

Design and Test of a System for Collection and Statistical Analysis of Data on Quadriplegic Patients

Dr. R. E. Carter

Baylor University
School of Medicine
1200 Moursund Avenue
Houston, Texas

This project is to design a system for collecting data on patients with spinal cord lesion and to statistically analyze the data. A remote 2260 on-line teleprocessing terminal is used for data input.

The Jerusalem Perinatal Survey

Dr. A. M. Davies

Hebrew University
Jerusalem, Israel

This project is to maintain a data bank of medical information on all pregnant residents of Jerusalem and their newborn infants for studies of morbidity, epidemiology, utilization, and planning of health services.

Programming in Support of Third National Cancer Survey

Mauchly and Company
330 Hungerford Drive
Rockville, Maryland 20850

The contractor is to maintain the Third National Cancer Survey computer system, generate data on cancer incidence, implement patient matching techniques to determine which individuals, out of about 400,000 patients, have identical or similar characteristics, and perform other supportive data analyses.

5.9 PATIENT POPULATION (cont.)

Natural History Heart, Cancer, Stroke in a Population

Dr. L. T. Kurland

Mayo Foundation
Rochester, Minnesota 55902

This project is to conduct epidemiologic and related clinical and pathologic studies built on the records of the Mayo Clinic and ancillary facilities. The occurrence and progression of disease in the community will be characterized for a period of at least 30 years. A storage and retrieval mechanism will provide ready access to data.

Studies of Improved Methods for Evaluation of Treatment in Cancer

Dr. A. R. Feinstein

United States Veterans Administration Hospital
W. Spring Street
West Haven, Connecticut 06516

Revised coding criteria for lung cancer and a manual on coding techniques have been devised. The "conversational mode" computer program for prognostic estimation has been completed, and a "batch processing" computer program for prognostic stratification is being prepared.

5.10 PHARMACY

Establishing a Narcotics Register

Dr. D. P. Conwell

Medical and Health Research Association
New York, New York

Reports on narcotics users are being used to establish a reliable, unduplicated count of addicts. The register, with appropriate validation components, is a potential source of incidence and prevalence statistics on addiction. Studies will be evolved concerning the use of services by these addicts and the evaluation of the various treatment programs in the city of New York.

5.10 PHARMACY (cont.)

A Proposed Study of Drug Utilization

Dr. R. F. Maronde

University of Southern California
School of Medicine
2025 Zonal Avenue
Los Angeles, California 90033

A patient drug file, documenting about 90 percent of the prescription drugs dispensed to over 250,000 patients, will be set up, using on-line electronic data processing techniques. Prescriptions will be evaluated for the amount of drug requested, combination with other prescribed drugs, and directions provided the patient.

5.11 PSYCHIATRY AND MENTAL HEALTH

Computer Facilitation of Psychiatric In-Patient Care

W. L. Bennett

Institute of Living
400 Washington Street
Hartford, Connecticut 06102

A hardware and software package is to be developed that can be readily adapted for use in both psychiatric and general hospitals. The Digital Equipment Corporation's PDP-15 computer will be used.

Factors Influencing Patient Conformity to Staff Expectations

L. B. Spearman

United States Veterans Administration Hospital
East 5th Street
Saint Louis, Missouri 63125

Data for measuring the major dependent and independent variables which influence patient conformity to staff expectation are being completed for computer processing.

Functional Analysis of a Psychiatric In-Patient Unit in a V. A. DM&S (General) Hospital

Dr. R. L. Christensen

United States Veterans Administration Hospital
150 Muir Road
Martinez, California 94553

Nearly 5,000 admissions to Psychiatry Service from 1957 to 1968 were coded. Recorded data included psychiatric and physical diagnoses, date of admission, length of stay, type of discharge, medications, type of treatment, and many other items characterizing the patient's history and current problems.

5.11 PSYCHIATRY AND MENTAL HEALTH (cont.)

A Multi-State Information System on Psychiatric Patients

Dr. E. M. Laska

Research Foundation for Mental Hygiene
Albany, New York

This project is to provide an automated patient data system for mental hospitals and community mental health facilities and to provide multi-state summary statistics for evaluation programs and treatment procedures.

Profiles of Hospital and Community Stay for Neuropsychiatric Patients

Discharged 1953 - 1963

E. K. Tarpy

United States Veterans Administration Hospital
Belmont Street
Brockton, Massachusetts 02401

The sample of neuropsychiatric patients was expanded to include data through 1969. Analysis of hospital and community stay will include time series, Markov chain process, and techniques developed by Morrison in his study of residence and subsequent risk of moving.

Programmed Evaluation in Community Mental Health Care

Dr. A. Zitrin

New York University
School of Medicine
550 1st Avenue
New York, New York 10016

Community mental health care will be quantitatively assessed by comparing the initial period of hospitalization and subsequent ward behavior of patients admitted to the Psychiatric Division of Bellevue Hospital as well as of patients in a control group.

5.12 RECORDS RESEARCH

Administrative Research in Automatic Data Processing

Dr. J. J. Matoole

United States Veterans Administration Hospital
4101 Woolworth Avenue
Omaha, Nebraska 68105

Before the Council of Medical Education of the American Medical Association approves a post-graduate educational program, it requires statistics (number of beds assigned to each training program, average

Administrative Research in Automatic Data Processing (cont.)

occupancy, staffing) on each specialty program. Because the requirements for inpatient beds vary from day to day in each specialty, a computerized program is to be developed to maintain data on each specialty and, on demand, to total all activities for any given time segment.

Bio-Medical Information Systems Design 06

T. E. Bauer

United States Army
Medical Research and Nutrition Laboratory
Denver, Colorado

This project is to develop a digital computer-based information system for processing and analyzing military biomedical research information.

Research from Medical Records on a Hospital Computer

Dr. L. Leiter

Montefiore Hospital and Medical Center
111 E. 210th Street
Bronx, New York 10467

Two computer systems, the Basic Patient Description and the Laboratory Information System, will be used to study the interrelationships between diagnostic categories and laboratory test findings. Additional diagnostic and treatment data from the medical record may be incorporated into the magnetic-tape files so more refined investigations may be conducted.

A Study of Audiology Data Sheets Designed to Utilize Electronic Storage and Retrieval Techniques for Clinical Research

James L. Shapley, Ph.D.

Veterans Administration Hospital
4435 Beacon Avenue, South
Seattle, Washington 98108

Two hundred patients will be audiologically examined, and the results computer processed to form a data bank valuable for investigating the relationships between hearing, loss and noise trauma, aging, medication, and disease. Data from existing audiology files will be transcribed.

Optimum Utilization of Hospital Ancillary Services

Dr. D. Valinsky

City University of New York
School of Medicine
10 E. 102nd Street
New York, New York 10029

Mt. Sinai School of Medicine
New York, New York 10029

This project will continue to use operations research techniques to optimize the use of hospital ancillary services. Research will include developing a Flow Model descriptive of patient demands and a computer simulation system to rapidly determine the impact of input variations and management and operational changes.

CHAPTER 6

REPORT SUMMARIES FROM THE DEFENSE DOCUMENTATION CENTER

The following are reports on recent Department of Defense contracts pertaining to medical record systems. The author, title, recipient institution, reference number, and abstract are given for each report.

Beck, William Stanislaus, Automation for the Hospital of Tomorrow, Aerospace Medical Division, Brooks Air Force Base, Texas, AD-677 593.

With the increasing emphasis on automation and shortage of skilled personnel within the medical service of the United States Air Force, the necessity for developing a mechanized system to assist in hospital and medical management became apparent. As project engineer for developing a medical information system by computer operation, the author has researched literature, visited hospitals with computers, talked with computer hardware salesmen, and attended meetings and seminars on computer usage. This paper is an attempt to familiarize others interested in computer application for hospitals and the medical fields with my research. (author)

Beck, William S.; Creamer, Ronald A., Hospital Information System Feasibility Study, Aerospace Medical Division, Brooks Air Force Base, Texas, AD-676 005.

In recognition of the complexity in the basic operation of hospitals today and the shortage of skilled personnel within the medical services, a feasibility study has been initiated for developing medical information system by computer operation using the systems engineering approach. This report outlines the developmental program for a transactional hospital information system which would include all Air Force medical installations and related medical activities. (author)

Boehrer, Jane M.; Ray, Hugh J., Jr.; Bates, Arthur W., Jr., Medical Food Service Computerization Study, School of Aerospace Medicine, Brooks Air Force Base, Texas, AD-689 162.

A report is made of the first Air Force attempt to test the feasibility of using a computer to solve daily planning and reporting problems involved in medical food service. The computer system was designed to calculate, store, and produce yield-adjusted recipes, procurement orders, issue orders, costing, and inventory maintenance. The study was limited to only the regular diets for one week of a standard Air Force hospital three-week menu cycle. The plan was tested using actual operational data from the test hospital. (author)

Boehrer, Jane M.; Paladino, Lorraine S.; Hugh, J., Jr., A Study of Automation in the USAF Medical Food Service, School of Aerospace Medicine, Brooks Air Force Base, Texas, AD-708 739.

A model computer system was designed in support of Air Force medical food service and related medical service accounting activities. Completed subsequent to research reported in SAM-TR-69-11, the system automates the production of yield-adjusted recipes, AF form 287 subsistence request, AF form 543 food issue record, AF form 449 menu production request, and the maintenance of perpetual inventory and cost accounting of medical food service subsistence. Based on the cyclic menu, recipes, and subsistence item stock of the individual medical food service operation, the model system was tested at 3510 USAF Hospital, Randolph Air Force Base, Texas. Results confirmed many methods and formulas and pinpointed specific areas requiring further refinement to obtain an efficient, reliable, and accurate electronic data processing system requiring a minimal amount of maintenance man-hours. (author)

Creamer, Ronald A., The United States Air Force Hospital System, Electronic Systems Division, L. G. Hanscom Field, Massachusetts, AD-674 593.

The paper describes in general terms a concept for introducing computers to all USAF medical facilities. It defines in depth the functions, applications, and growth potential which can accrue within the

USAF hospital system. It also describes additional benefits possible on a regional and world-wide basis which could evolve from connecting the hospitals to a communication network. Research potentials of the system are also projected. (author)

Creamer, Ronald A.; Fagan, George A., An Evolutionary Plan for the Integrated USAF Medical Information System, Electronic Systems Division, L. G. Hanscom Field, Massachusetts, AD-679 544.

The planning document describes a method by which the integrated medical information system could evolve. The program is delineated into six categories: patient care facilities; regional (inter-hospital) activities; central (inter-regional) activities; research and education apsects; special projects; automated armed forces entrance and examination stations (AFEES) (induction centers). The first four categories are recommended to evolve sequentially whereas the special projects can be handled independently, and later be included as their development matures. The last category, automated AFEES, was included to imply an inseparable relationship between the initial medical record and the subsequent records generated during active duty; however, the automated AFEES is covered in more depth in other documentation. (author)

Deland, E. C.; Waxman, B., Review of Hospital Information Systems, Rand Corporation, Santa Monica, California, AD-708 427.

A modern metropolitan hospital, perhaps more than any other social institution, is dependent upon rapid and accurate information flow. Because, in the practice of modern medicine, correct information at the right time can be vital to save a life or prevent a catastrophe, the hospital is increasingly vulnerable to failures in the information set. Although the amount of information is burgeoning in parallel with medical-science research, interest in reliable, automated medical-information processing has only recently begun to grow. The paper reviews the current status of this country of automated hospital information systems, with particular emphasis on the involvement of the U. S. Public Health Service in the development and deployment of these systems. (author)

Deland, E. C.; Raub, W. F.; Stacy, R. W.; Waxman, B. D., Computers and the Delivery of Medical Care, Rand Corporation, Santa Monica, California, AD-682 952.

The volume is intended to be illustrative of the degree to which the computer is being effectively used in the delivery of medical care. (author)

Fink, C. Dennis, Establishment of a Tumor Registry System for Louisiana: Proposals on Objectives, Capabilities and Structure, Human Resources Research Organization, Alexandria, Virginia, AD-711 249.

Tumor registry supervisors and secretaries and hospital administrators at nine Louisiana hospitals and clinics were interviewed to obtain information to guide the design and development of a central tumor registry and state-wide registry system. The study was conducted by the Human Resources Research Organization (HUMRRO) under the sponsorship of the Louisiana Regional Medical Program. Information was obtained on (a) local interest in the establishment of a state-wide registry system; (b) services which a central registry might provide; (c) the manner in which existing local registries are utilized; and (d) conditions under which hospitals would be willing to join the Central Registry System. Six hospitals and one community registry were identified as candidates for incorporation into the initial registry system. It was recommended that the registry system be organized around community registries with support provided by a central registry. The need for the registry system to concentrate on high-valued services and products was emphasized. (author)

Gelblat, Marvin, Computerized Storage and Retrieval of Cardiac Catherization and Pathology Data, Pennsylvania University, Moore School of Electrical Engineering, Philadelphia, AD-671 912.

The doctor who is mainly concerned with patient care has felt the impact of the computer only insofar as the results have added to the vast store of knowledge he must have readily available. In this paper the use of the problem-solving facility of the Moore School of the University of

Pennsylvania to eliminate a major phase of this information problem in the medical field is demonstrated. Patient records generated in the Cardiac Catheterization Laboratory and in the Surgical Pathology Department of the Hospital of the University of Pennsylvania are stored on magnetic disk and are available for immediate retrieval. With the idea that any operational changes brought about by the new computer technology should be kept to a minimum, flexowriters are used to convert automatically an edited version of the pathology record into machine readable form as the secretary types the final report. (author)

Syner, James C., A Computer Based Biomedical Information System, Army Medical Research and Nutrition Laboratory, Denver, Colorado, AD-681 893.

A digital computer based biomedical information system was designed to service the needs of physicians engaged in patient care and clinical research and scientists engaged in laboratory research. The system embraces all functions of information processing which include information collection, storage, retrieval, analyses and display. The principal goal of the project is to place these functions under the maximum degree of automation possible with existing hardware-software capabilities. At the time of this report the status of the system is best characterized as "semi-automatic." From the time of inception, and throughout implementation, the project has been carried out under the concepts, principles and techniques of the systems analyses. Experience has demonstrated that a total biomedical information system to service a complex medical facility such as the Fitzsimons General Hospital establishment will necessarily evolve through several generations of hardware-software alterations. There will probably never be a total solution to the problem but rather sequential events viewed as minor to major achievements representing progress towards an ever improving system. Progress is absolutely dependent upon support and participation from the professional staff, including both physicians and scientific investigators. (author)

Wolin, Burton, R.; Davidson, Roy; Doyle, Lauren B.; Wallace, Ruth, Feasibility and Demonstration Study for the Application of Micro-Image Techniques to Navy Radiology Services, Technomics, Inc., Falls Church, Virginia, AD-709 992.

The study explores the feasibility of applying mid-range (50-100 diameters reduction) microfiche technology to x-rays at Bethesda Naval Hospital. Purpose: to determine whether this technology can help to increase the efficiency of the delivery of health care as well as reduce some of the costs related to radiology. Present radiology procedures at Bethesda Naval Hospital were studied in detail. Tests were made of radiographic images reduced 56 diameters. Two theoretical system models were developed to assess the procedural implications of using microfiche. The film technology does not yet yeild wholly satisfactory images, but appears right on the verge of doing so. Procedurally, the use of fiche promises a flexible system that will effectively attack problems of lost or missing x-rays, of file space, and of physician and clerical time. System improvements unrelated to the use of fiche were explored. Tests in practice will be required to establish accurate cost/effectiveness measures. (author)

Zhukovskaya, E. A.; Koryakov, Information Retrieval Systems, Their Development Use and Application (Selected Articles), Foreign Technology Division, Wright-Patterson Air Force Base, Ohio, AD-716 521.

Contents: possibilities for using information retrieval systems in geology; information retrieval system for centralized record keeping for oncological patients.

The Use of Computers in Medicine, Volume 1, Defense Documentation Center, Alexandria, Virginia, AD-840 800.

The bibliography is a compilation of references from the DDC collection on the use of computers in medicine. The references are mainly concerned with the computer's application as a direct tool in medical research. The topics covered are: (1) computers in biomedical systems; (2) biological simulation; (3) biomedical monitoring; and (4) data analysis.

<u>The Use of Computers in Medicine</u>, Volume 2, Defense Documentation Center, Alexandria, Virginia, AD-675 600.

The bibliography is a compilation of references from the DDC collection on the use of computers in medicine. The references are mainly concerned with the computer's application as a direct tool in medical research. The topics covered are: (1) computers in biomedical systems; (2) biological simulation; (3) biomedical monitoring; (4) computer-aided diagnosis; and (5) data analysis.

<u>Systems Analysis Study Towards a 'New Generation' of Military Hospitals, Volume V, Data Inventory</u>, Westinghouse Electric Corporation, Pittsburgh, Pennsylvania, Health Systems Department, AD-716 504.

The data collected during on-site visits to the three primary base level health care systems (Walson Army Hospital, Malcolm Grow Air Force Medical Center and Beaufort Naval Hospital) and the six secondary base level health care systems (Wilford Hall Composite, Womack Army Hospital, Jacksonville Naval Hospital, Dewitt Army Hospital, Oakland Naval Hospital, and March Composite) are summarized in this volume in the form of matrices, tables and figures. The data represented forms a major data resource for the systems analysis volume of this final report. The data inventory focused on the following hospital functions: information flow; patient flow; material flow; medical records summary; education and training; clinical laboratories; dietary; dentistry; dispensaries; medical records; pharmacy; outpatient department; radiology; registrar; and ward management. (author)

CHAPTER 7

BIBLIOGRAPHY

7.1 INTRODUCTION

The current literature (1968 to 1970) on medical record systems and procedures was reviewed using the computer search capability of the National Library of Medicine. A manual review was done of literature related to management and personnel in the Medical Records Department. The articles compiled in these two reviews have been collated and appear in Sections 6.2 through 6.8.

Medical record references concerning filing and numbering, medico-legal aspects, administrative responsibility, dictation and recording, patient records, and medical audit in the outpatient department are available from:

Office of Consultation on Hospital Functions
Health Facilities Planning and Construction Service
U. S. Department of Health, Education and Welfare
5600 Fishers Lane
Rockville, Maryland 20852

Commercially available bibliographical services that can provide in-depth searches for a specific title are:

- Bio-Sciences

  Information Service of Biological Abstracts
  200 Arch Street
  Philadelphia, Pennsylvania 19103
  Mrs. Phyllis V. Parkins

- Current Index to Conference Papers in Engineering; Life Sciences Scientific and Technical Literature

  CCM Information Corporation
  909 Third Avenue
  New York, New York 10022
  Mr. Richard P. Kollin

- Chemical-Biological Activities

  Chemical Abstracts Service
  The Ohio State University
  Columbus, Ohio 43210
  Marketing Department

- U.S. Government Research and Development Reports

  National Technical Information Service
  5285 Port Royal Road
  Springfield, Virginia 22151

- International Reports

  Sadtler Laboratories
  3316 Spring Garden Street
  Philadelphia, Pennsylvania 19104
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  325 Chestnut Street
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SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA

FINAL REPORT

TO:

REGIONAL MEDICAL PROGRAMS SERVICE
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
CONTRACT NUMBER - HMS 110-70-349

VOLUME III
METHODS MANUAL

A MANUAL OF INSTRUCTION IN SOME ANALYTICAL METHODS WHICH CAN BE USED TO EVALUATE PROCEDURES FOR PROCESSING, ENTERING, STORING, AND RETRIEVING MEDICAL RECORD INFORMATION

HEALTH SYSTEMS RESEARCH CENTER

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA

HEALTH SYSTEMS DEPARTMENT

WESTINGHOUSE ELECTRIC CORPORATION
PITTSBURGH, PENNSYLVANIA

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SYSTEMS ANALYSIS

OF MEDICAL RECORDS

IN GEORGIA

FINAL REPORT

This project was conducted under contract HSM 110-70-349
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VOLUME III

METHODS MANUAL

Health Systems Research Center
Georgia Institute of Technology
Atlanta, Georgia

Health Systems Department
Westinghouse Electric Corporation
Pittsburgh, Pennsylvania

September 1971

PREFACE

The present volume, Volume III of a three-volume final report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA, contains a description of four analytical methods which can be used to evaluate procedures for processing, entering, storing, and retrieving medical record information. This volume, entitled METHODS MANUAL, is submitted in compliance with United States Public Health Service contract HSM 110-70-349, Modification No. 1, and the volume contains training materials suitable for use in medical records systems workshops and is submitted in lieu of conducting a workshop in medical records systems. Volume I contains a summary of the project, and Volume II contains a review of the state-of-the-art in medical records systems. The project was conducted jointly by the Health Systems Research Center of the Georgia Institute of Technology and the Health Systems Department of Westinghouse Electric Corporation for the Regional Medical Programs Service of the Health Services and Mental Health Administration in the period July 1970 through September 1971.

The objectives of the project were to describe the state-of-the-art in medical records systems and to develop analytical methods for studying and improving medical records systems in health-care facilities. During the course of the project, twelve hospitals, five nursing homes, and one neighborhood health clinic were studied by the project team.

At each facility, data on the management and flow of medical record information were collected by using one or more of the four methods developed in the project. The purposes of the data collection were: (1) to test and refine the methods and (2) to construct a profile of basic information regarding the use and maintenance of medical records systems. During the course of data collection and methods development, two proprietary computer programs of the Westinghouse Electric Corporation were employed; these programs were the Network Analysis Method and Work Sampling Method. Also, the method described in Chapter 3 of Volume III was based largely upon the Hospital Staffing Methodology for Medical Records, which was developed at the University of Michigan. Data regarding the state-of-the-art in medical records systems was obtained via direct inquiry to manufacturers and users of these systems. An extensive bibliography of journal articles and project reports was also prepared. Neither an examination of the medical-decision-making aspects of the medical record nor an analysis of the quality of the medical information residing in the medical record were included in the project. While these topics are important, their consideration was beyond the scope of the project.

The successful completion of this project was due to the efforts of various individuals, institutions, and groups to whom credit is gratefully extended. Important contributions were made to the project by the following on behalf of the Health Systems Research Center: John W. Coyle, Gerald L. Delon, Chris C. Efland, Terrance M. Patrick, James F. Smith, Karenan P. Stubbs, and Gerald B. Widegren. Major contributions were made to the project by the following members of the Health Systems Department: Charles C. Camp, Edwin E. Keelen, Frank W. Koenig, and Stewart F. Paterson. The present volume was written by Messrs. Camp, Coyle, Delon, Keelen, Paterson, Smith and Widegren.

Appreciation is extended to Dr. J. Gordon Barrow and the staff of the Georgia Regional Medical Program for their advice and cooperation. Also, acknowledgement is given to the several consultants and members of the advisory board to the project for their valuable contributions and active interest.

In particular, sincere appreciation is extended to the many medical records librarians, administrators, nurses, physicians, and other personnel who so graciously and generously contributed their time and thoughts to the project. Their busy schedules were interrupted for extended periods of time, and the project could not have been completed without their assistance.

Harold E. Smalley, Director
Health Systems Research Center
Atlanta, Georgia
September 28, 1971

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CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE OF THE VOLUME

The objective of the present volume is to describe four analytical methods which are suitable for application in an analysis of medical records systems in hospitals and other health-care facilities. The volume is intended to serve as a manual of instruction for medical records librarians, hospital systems analysts, and other individuals who are concerned with improving medical records systems. The methods described herein are appropriate for analyzing the management and flow of medical-records-related information rather than for examining the medical-decision-making aspects of the medical record or analyzing the quality of the medical information residing in the medical record. Specifically, the methods can be used to analyze and evaluate procedures for processing, entering, storing, and retrieving, medical record information.

1.2 APPLICATION OF THE METHOD

In health care delivery facilities such as hospitals, neighborhood health centers, doctors' offices, and nursing homes, the timely availability of desired information is fundamental to the delivery of the most beneficent medical care and to the efficient operation of the facilities. The collection of resources and procedures which generate, store, process, and communicate information within health-care facilities is commonly referred to as a medical information system, particularly in hospitals. In general, medical information systems are inefficient and inadequate* when measured against the performance of other currently established information systems, such as the systems which serve the information needs of business and the military.

The individual patient's medical record serves as the primary vehicle for entry, storage, and retrieval of patient-related data within health-care facilities and is, therefore, an important element in a facility's information system. Furthermore, the medical record is an essential element in the

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* An extensive bibliography on medical information systems is contained in Volume II, STATE OF THE ART REVIEW, of the report, SYSTEMS ANALYSIS OF MEDICAL RECORDS IN GEORGIA.

diagnosis and treatment of patient ills. Consequently, any attempt to improve medical information systems should focus on the medical record.

The four methods in the present volume are recommended for inclusion in the systems analysis study which should be conducted before an attempt is made to actually improve the information system within a facility. The purpose of the systems analysis study is to determine:

1. How, when, where, and by whom the medical record is used.

2. The number and nature of information inputs and outputs to and from each department in the facility which are directly and indirectly related to the medical record.

3. Problems which are encountered by personnel who use the medical record.

4. The utilization of Medical Records Department personnel and the amount of time devoted to each work category in the department.

5. How existing staffing and operating procedures in the Medical Records Department compare with established standards in terms of number of personnel required to complete required work activities.

6. What suggestions for improvement in forms design, procedures, record availability, and so forth, are recommended by the personnel of the various departments who use the medical record.

The methods described in this manual are neither expensive nor elaborate to apply. The instructional materials in Chapters 2 through 5 are designed to be understood by an analyst in the employ of the health-care facility. In the case of the typical solo and group physicians' office, where an analyst would not normally be employed, an outside consultant, preferably one who is experienced in the health-care environment, can be retained to perform the systems analysis study.

CHAPTER 2

COMMUNICATION NETWORK ANALYSIS

2.1 INTRODUCTION

This chapter describes the communication network analysis method for defining and quantifying the flow of information related to hospital medical records. The method provides the systems analyst, who is concerned with improving a medical records system from an information flow perspective, with an organized procedure for collecting the data necessary to characterize the flow of medical-record-related information in hospitals and other health-care facilities.

2.1.1 Purpose of the Method

The communication network analysis method was designed as a relatively simple and inexpensive method of performing communication flow studies in hospitals and related health care facilities. This method may also be used to determine inter- and intra-departmental data flows and flows among various health care facilities and agencies outside the study hospital. Data are gathered primarily through semi-structured interviews with selected hospital staff members.

2.1.2 Utility of the Method

The communications network analysis approach is intended to be used by systems analysts familiar with the health care environment. However, if less experienced people are to be used as data collectors, more detailed and explicit procedures are available that personnel can use with only limited supervision from an analyst. (See Sections 2, 3, and 4 of Appendix A.)

The method is most effectively used in inter-departmental communication. And, although the method was not tested on an intra-departmental basis, it can also be used in large multi-divisional departments such as the Nursing Services Department or the Clinical Laboratory to determine the communication flow.

The data collected must be general in nature, since the method is not suited for identifying specific data elements, and data regarding the communication links must be readily available to department staff members.

The method does not describe data files, nor does it identify the termination of communication at a data file.

2.1.3 Definition

To improve the reader's understanding and reduce the possibility of misinterpretation, several terms used in the communication network analysis are described below.

- Activity, function or department -- a point where data is transmitted or processed.
- Communication link -- the vehicle for transmitting data from one activity to another, for example, telephone calls, letters, forms, and verbal instructions. An individual link is distinguished by its unique purpose such as a request for laboratory results, report of hospital census, or instructions to perform a particular task. The basic assumption is that the originating and recipient activities are different and that a link can be received by several activities at the same time.
- Inputs -- the input is defined by the recipient of the communication link. The input may be further defined by the action taken by the recipient activity.
- Outputs -- any communication originating within an activity with a separate and distinct purpose.
- Preparation mode -- the method of recording data at the origin of the communication link. The origin of the link is always the department identified as the outputing function.
- Preparation time -- the time required to collect and record the data upon the communication link. This applies to administrative procedures only and not to the time required to generate the data as in the case of a laboratory or radiology report. Preparation time applies to outputs only.
- Queue time -- the amount of time a communication link is held before action is taken on it. Queue time applies to inputs only.
- Transportation mode -- the method most commonly used in transporting a communication link.

- Volume -- the number of separate and identifiable communication links (for example, the number of monthly pharmacy requests between the Nursing Service and the Pharmacy).

2.1.4 Principles of Communication Network Analysis

The communication network analysis method measures the time required to prepare a communication and the time required for a link to be used at the recipient end. These independent variables may be used to characterize both the urgency of a communication and the manpower required to prepare each link. The dependent variables define the transportation and preparation modes.

2.2 APPLICATION OF COMMUNICATION NETWORK ANALYSIS

The key to successfully collecting data at any facility is to establish firm liaison with the administrator and key department heads prior to initiating data collection. It is strongly recommended that a briefing be held with key staff members one to two weeks prior to the actual data collection. At this meeting, appointments should be set up (specific days and times) and the staff should be instructed to prepare examples of all communications within their area of responsibility.

The procedures are much simpler in small facilities and the staff members are generally more aware of the total operation. Larger facilities will require thorough recapitulation because the interviewees are more likely to give incorrect information. Typical errors are omitting a link or identifying a link as terminating at the business office when it may actually go to the Admissions Office or the Medical Record Department.

2.2.1 Data Requirements

Data specifications vary according to the objectives of the systems analysis study. The method discussed here was limited to six departmental areas: Medical Record Department, Nursing Service, Admissions and Business Office, Radiology Department, Clinical Laboratory, and Pharmacy. These areas were selected because of their high volume of data flow and their input to the medical record. The method can be easily expanded to more departmental areas, if desired.

Two sets of data must be collected. The first set, which describes the facility's operating characteristics, can be initiated at the pre-data collection orientation/liaison visit. Data should be collected that describe the general workload of the facility, such as the operating hours of each department, average daily admissions and discharges, average length of patient stays, the number of nursing units, the number of staff physicians, medical records retention policy, medical records completion policy, and others that can assist in quantifying the volume of many communication links. A sample form for collecting such data is included in Figure 2.1. Another form may be used to collect data on problems, trends, or recent changes in operational procedures which might affect communication flow (see Appendix A, Section 1). Such data can help the interviewer improve the specificity of later interviews. The more structured the interview procedure, the more effective it will be.

If a computer system is in operation, an effort should be made to understand its input into the medical records system. Items of importance and interest are:

- Computer type and cost
- Peripheral equipment and location
- Staffing and technical support
- Feasibility studies conducted
- Patient data captured by the system
- Existing software
- Initial motivation for system
- Biggest problems encountered.

The major effort in collecting the second set of data is to define and quantify the communication links. This is done through interviews with selected personnel from the designated study areas. If these interviews are conducted by relatively inexperienced personnel, it is best to first define all anticipated communication links for each department; such an enumeration is a valuable aid to structuring the interview and helps ensure that no links are omitted. Sample forms used for the six study areas can be found in Appendix A, Section 2. If analysts are available who are familiar with the hospital environment, a shorter time-saving version of this method can easily be applied (see Figure 2.2).

Hospital: ________

Date: ________

Interviewer: ________

HOSPITAL PROFILE VARIABLES

The following information should be obtained for each study site hospital:

- Number of beds
- Admissions rate
- Occupancy rate
- Number of nursing units
- Number of beds per unit
- Teaching/internship programs
- Research
- Outpatient/emergency room load
- Number of personnel
- Number of attending doctors
- Number of staff doctors
- Operating budget
- Nursing unit staffing
- Special services
- Laboratory automation
- Geographic location
- Average length of stay
- Layout sketch
- Accreditation
- Degree of hospital automation
- Future plans
- Participation with outside research groups
- Degree of external communications
- Laboratory volume
- X-ray volume
- ER volume
- OPD volume
- OR volume
- Building age and renovations
- Number of levels
- Number of patient care areas
- Administrator tenure
- Affiliation
- MR department info

FIGURE 2.1 Sample Pre-Data Collection Form

Date: 31 May 1971

Hospital Number: 1 Interviewer: [illegible] Page 1/1 Department Medical Records

COMMUNICATION LINK NAME BY DEPARTMENT	INPUT	OUTPUT	FROM OR TO	INPUTS MONTHLY VOLUME	INPUTS QUEUE TIME, HRS.	OUTPUTS MONTHLY VOLUME	OUTPUTS PREP. TIME, HRS.	TRANS MODE HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER	PREP MODE HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	COPIES/FORM	REMARKS
Admissions and Summary Sheet		X	Adm			22	.5	✓								✓					
Admission Form	X		Adm	900	.05				✓							✓					
Admission Form	X		ER	5	.07			✓							✓						Emergencies only
Daily Patient Census		X	Adm			30	.5	✓								✓					Original typed only
"		X	Executive			30	.01														
"		X	Nurs Svc.			30	.01														
"		X	Bus. Ofc.			30	.01														
"		X	Lab			30	.01														
"		X	X-ray			30	.01														
"		X	Pharm.			30	.01														
"		X	ER			30	.01														
Medical Record		X	Nurs. Svc.			800	.01	✓										✓			For all previous adm
"		X	Adm.			100	.01	✓										✓			
"		X	ER			10	.01	✓										✓			
"	X		Nurs. Svc.	900	.2			✓										✓			Time for assembly
TOTALS																					

FIGURE 2.2 Sample Data Collection Sheet

Simple block diagrams (Figure 2.3) are used to develop specific flow charts for each department, based on input from the interviewees. The interviewer may record the data directly onto the form during the interview or later transfer the data to the form from his notes. Volumes, preparation time, queue time, and other notes can be recorded on the chart. Multiple links to and from a particular department may be indicated by multiple lines or multiple blocks. For less experienced interviewers, anticipated flows can be used as demonstrated in Appendix A, Section 3.

Since it is important to identify which forms are used for each communication link, forms should be collected during the interview, if possible. Figure 2.4 lists the most common hospital forms. These lists can aid the interviewer in soliciting comprehensive data and in relating the form to each link, since he may assign a sequential number to each link and recording this number next to the name of the form. Uniform nomenclature for similar forms is essential in multi-facility studies so the forms from each facility can easily be compared.

A method for checking the accuracy of the number and volume of communication links is essential. Figure 2.5 is a simple means of summarizing the data collected during interviews. The number of input and output links between two departments should always be equal. For example, if the Admissions Department identified three outputs to the Medical Records Department, the interview with the Medical Records Department staff should identify three inputs from Admissions. If a discrepancy in the number is found, both departments should be revisited. The department with the least number of communication links is most likely in error. The same rule can be applied to the summarization of communication link variables. This method of recapitulation is essential if two or more analysts are interviewing simultaneously. If untrained analysts are used, a listing of anticipated communication links may be helpful, as shown in Appendix A, Section 4.

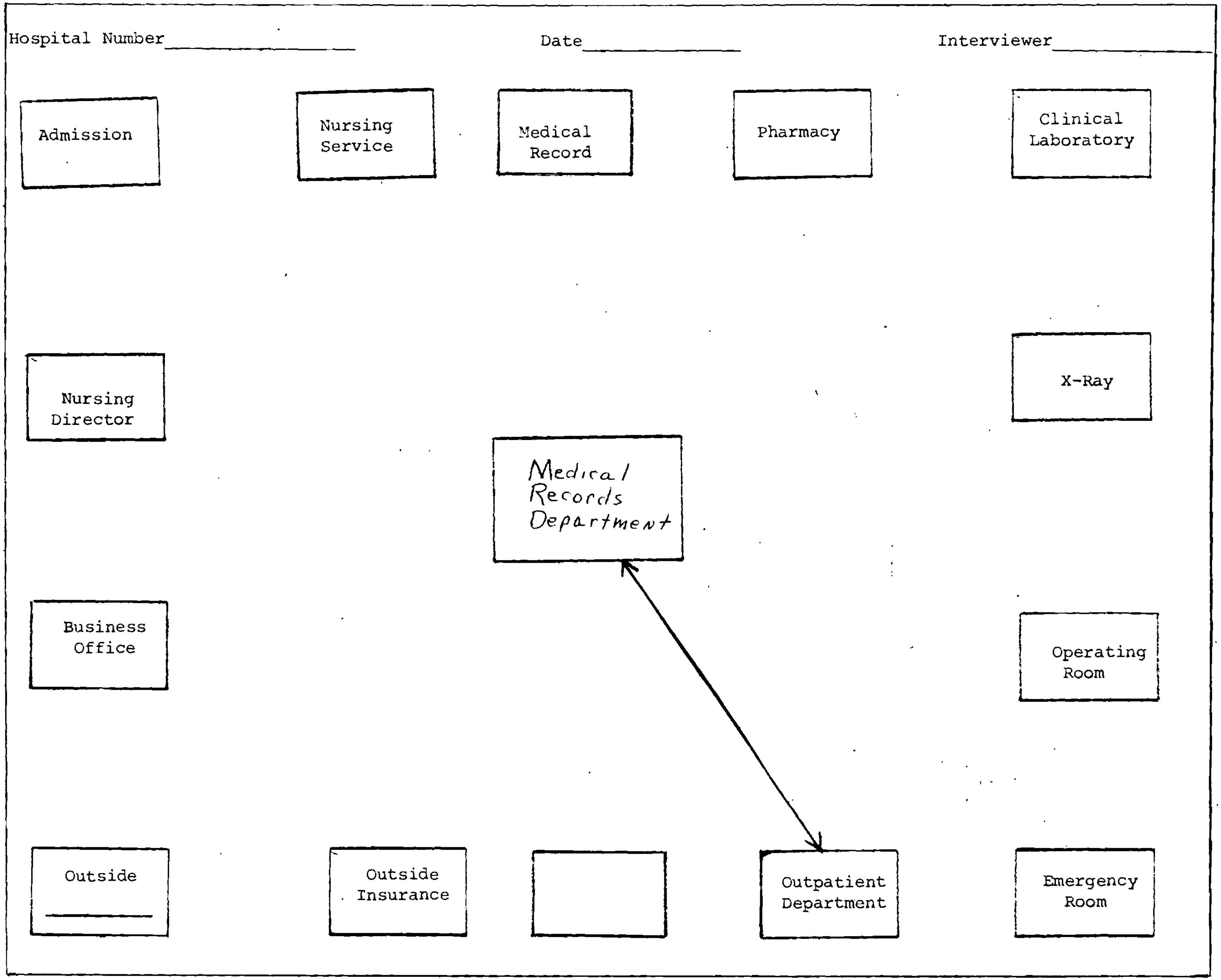

FIGURE 2.3 Sample Block Diagram Used to Indicate Communication Flows

INPUTS TO	OUTPUTS FROM
Admissions	**Admissions**
. Request for beds	. MR
. Discharge rep	. Adm/Dis Summary
. Adm diagnosis	. Patient Acc Folder
	. Adm form
	. Adm diagnosis
	. BC authorization
	. Request for beds
Nursing	**Nursing**
. X-ray results	. Req for X-ray
. Lab results	. Req for lab
. MR	. Req for pharmacy
. Typed hist and phy	. MR
. Adm/Dis summary	. Discharge report
. Dischargd Pat MR	. Daily census
. Narc med rec	. Old MR request
. IV orders	. Hist & phy
. Request for beds	. Late path report
. OR report	. Narc med rec
. Path report	. IV orders
. Typed consultations	. Diet orders
. Blood result	. Dischge control rec
. Blood bottle report	. Long stay form
. EKG report	. Old MR
. ER chart	. Late EKG report
	. Late X-ray report
	. Consultations to be signed
	. Blood request
	. Blood bottle request
	. EKG request
Medical Records	**Medical Records**
. Daily patient census	. Phy operative rep
. MR request	. MR
. OR report	. Tissue Comm Review Form
. MR	. Typed hist and phy
. MR info request	. OR report
. Late lab report	. MR info req
. Consultations	. Pathology rep
. History and physical	. Consultations
. Long stay review form	. Infection rep
. ER slips	. Death report and chart
. Pathology report	. Discharged pat MR
. Autopsy report	. MR info
. Tissue Committee Report	. Long stay review form
. Adm slip	. Other special reports
. Discharged patient MR	. Adm/Dis Summary
. Late EKG	. Daily Patient Census
. Late x-ray	
. OP/ER x-ray (delinquent)	
. MR info	
. Adm/Dis summary	
. Monthly x-ray report	

FIGURE 2.4 Checklist for Common Hospital Forms

INPUTS		OUTPUTS	
Pharmacy		**Pharmacy**	
. Pharmacy request	______	. Billing chits	______
. Narc med record	______	. Narc med record	______
Laboratory		**Laboratory**	
. Lab test request	______	. Lab report	______
. Lab info	______	. Lab billing chits	______
. Pathology reports	______	. Pathology report	______
. Blood requests	______	. Lab results	______
. EKG request	______	. Blood test results	______
. Outside lab results	______	. EKG report	______
. Blood bottle request	______	. Outside lab request	______
		. Blood billing request	______
		. Blood bottle report	______
		. Lab info request	______
X-Ray		**X-Ray**	
. X-ray report	______	. X-ray results	______
. Request for info	______	. X-ray information	______
. X-ray request	______	. X-ray billing chits	______
		. Late x-ray results	______
		. X-ray report(monthly)	______
OR		**OR**	
. ER chart	______	. ER chart	______
. Blood report	______	. X-ray request	______
. MR	______	. Pathology request	______
. Pathology results	______	. Blood request	______
. Lab results	______	. Lab request	______
. X-ray report	______	. MR	______
		. OR diagnosis	______
		. OR log	______
ER/OP		**ER/OP**	
. MR	______	. Bed request	______
. X-ray results	______	. Outpatient MR	______
. Lab results	______	. X-ray request	______
. Discharged pat rec	______	. Lab requests	______
. X-ray info	______	. MR	______
. X-ray billing chit	______	. Pat acc folder	______
. Lab billing chit	______	. OP/ER adm form	______
. EKG report	______	. ER chart	______
		. Dischgd pat MR req	______
		. EKG request	______
		. X-ray info req	______
Business Office		**Business Office**	
. Patient accounting file	______	. Blue Cross bill	______
. Pharmacy billing	______	. Medicare bill	______
. Lab billing	______	. Medicaid bill	______
. X-ray billing	______	. Group insurance bill	______
. Adm/Dis summary	______	. Open account bill	______
. BC authorization	______	. MR info request	______
. MR info	______		
. Dis control record	______		
. ER/OP record	______		
. Blood billing chit			

FIGURE 2.4 Checklist for Common Hospital Forms (cont.)

Outputing Department

Adm	Nur	MR	Phr	Lab	X-Ray	OR	ER/OP	Bus	Other	Inputing Department
										Admissions
										Nursing
										Medical Records
										Pharmacy
										Laboratory
										X-Ray
										Operating Room
										Emer Rm/Outpatient
										Business Office
										Other
										Totals

Total Number of Communication Links

Outputing Department

Adm	Nur	MR	Phr	Lab	X-Ray	OR	ER/OP	Bus	Other	Inputing Department
										Admissions
										Nursing
										Medical Records
										Pharmacy
										Laboratory
										X-Ray
										Operating Room
										Emer Rm/Outpatient
										Business Office
										Other
										Totals

Total Volume of Communication Links for One Month

FIGURE 2.5 Forms for Summarizing Interview Data

2.2.2 Procedures for Applying the Method

As previously stated, the pre-data collection/liaison visit is extremely important for fruitful data collection. If the task is to be undertaken by resident staff members, the pre-data collection presentation should be made to the following:

- Administrator
- Director of Nursing
- Chief Radiologist
- Business Office Manager

This initial presentation does not preclude a more detailed orientation of all departmental participants immediately prior to the actual data collection. The main objective of the initial presentation is to establish a climate of enthusiastic cooperation and a tentative schedule with each department. If an outside agency is conducting the study, a schedule should be established about one week before data collection.

Since the interview is the method used for data collection, considerable emphasis should be placed on the interview technique. Appendix A, Section 5 contains suggestions for successful interviewing. Some general guidelines for the interview data collection procedure are:

- Data collectors should not move into any facility on a Monday and not before 10:00 a.m. on any other day.
- Only two persons should be in a department at any one time. If the team is larger than two, the others should conduct interviews in other parts of the facility.
- If a team approach is used, one of the interviewers should ask the questions and the other should fill out the forms.
- One interviewer should take responsibility for recapping each interview, and his write-up should be reviewed by his partner. If more than one interview is performed, interviewers can alternate roles.

- Interviews should be recapped the same day, if possible, but no later than the next day.
- No more than four interviews should be scheduled per day per interview team, and only two per day if solo interviewers are used.

A suggested sequence of events, outlined in Table 2.1, includes the orientation conference, a tour of the hospital, and interviews with the medical records librarian, nursing personnel, and personnel in ancillary areas. It is important that the data collection team be flexible enough to change appointments with interviewees and fill in with other work when appointments are cancelled at the last minute. The interviewer should be sensitive to the workload and urgency of the interviewee's time.

While the interview may begin with any of the data collection forms perviously discussed, all communication links must be defined. In most cases the discussions will end with the definition of the communication link's volume, preparation, and queue times.

2.2.3 Method Results

Upon completion of all interviews, narrative information will have been accumulated on each department's functions as well as problems, suggestions, and trends which relate to the medical record department and/or the medical record per se. Some of the comments, particularly problems and suggestions, obtained from the interviews may have been previously expressed by the interviewee to the medical record librarian, hospital administrator, supervisor of nursing or some other point of authority in the hospital. Very possibly, many worthwhile comments may have been disregarded because the comments were not made to the appropriate authority or were forgotten in the busy daily routine of the hospital. However, if the method described in this chapter is employed in a study of a hospital's medical record system, the comments of the hospital staff are documented and, therefore, more likely to be carefully considered, in particular if the support and active interest of the administrator and department heads are obtained. The documented comments become more useful if sorted into categories as in Table 2.2, which contains examples of problems obtained from interviews in the Medical Records

TABLE 2.1 Network Analysis Sequence of Events

Event	Participants	Duration	Purpose	Results
Orientation Conference	Administrator Associate Administrator Chief of Nursing Assistant Chief of Nursing Chief Radiology Technician Assistant Medical Records Librarian Chief of Pharmacy Chief Laboratory Technician Business Office Manager All Study Team Members	1 hour	Make introductions and orient participants to study methodology.	Questions relating to study methodology answered. Tentative interview schedule arranged with department heads.
Tour of Hospital	Administrator or Representative All Study Team Members	2 hours	Orient Study Team to hospital operation and department location.	Study Team questions answered. Hospital profile form filled out.
Interview: Medical Record Librarian	Chief Librarian--Medical Records	1-1$\frac{1}{2}$ hours	Obtain overview of Medical Records Department operation. Identify key personnel for detailed interviews.	Basic understanding of department operation including salient problems and trends. Medical Records personnel identified for additional interviews.
Interviews: Nursing Personnel	Chief nurse of each type ward: Medical Surgical Pediatrics OB/GYN Nursery Delivery Room Operating Room	1/2 hours per interview	Fill out network analysis forms. Obtain problems and trends.	All inputs and outputs, identified and defined for nursing units.
Interview: Ancillary areas and other departments	Pharmacy Technician Radiology Technician Clinical Laboratory Technician Admissions Business Office ER and Out-patient Clinic	1 to 2 hours per interview	Fill out data collection forms.	All inputs and outputs identified and defined.

Department, Nursing, Pharmacy, and the Admissions Office. The problems in Table 2.2 are grouped into three categories. Problems listed under the category, MEDICAL RECORD, are related to the medical record itself; that is, problems associated with the entry, processing, and retrieval of medical record information or with the storage or availability of the medical record are included in this category. Problems listed under the category, FORMS DESIGN, are related to the suitability of the forms in the medical record. Problems listed under the category, OPERATIONAL PROCEDURES AND PERSONNEL, are related to the control and utilization of the medical record and to the time and cost involved in handling the medical record.

The problems listed in Table 2.2 are actual comments obtained in interviews while employing the communications network analysis method. (The Appendix to Volume I, PROJECT SUMMARY, of the present report contains an extended listing of problems and suggestions and trends for the departments of several hospitals in which the communications network analysis method has been used.)

In addition to the problems, suggestions, and trends, the application of the communications network analysis method will yield values for the communications flow parameters of the facility's medical records system. In the interviews, all input and output communications links are identified (communications link is defined on page 2-2 of the present volume), and the total monthly volume for each input and output communications link for each department in the facility is entered on data collection forms similar to the form illustrated in Figure 2.2. In addition, the method of preparation and transmission for each input and output link is on the same data collection forms. The entire set of completed forms normally consists of as many forms as the number of hospital areas examined, since one data collection form normally suffices to describe a department's input and output links.

Total monthly volume of communications for the entire facility and for each department can be obtained from the forms. The total monthly volume of communications, sorted according to transportation modes, also is available for the entire hospital and for each department. In computing total monthly

TABLE 2.2 Example of Problems Related to the Medical Records System Obtained in Interviews with Hospital Personnel.

THE MEDICAL RECORD	
Source of Comment	Problem
Medical Records Dept.	Admissions does not give patients full name properly, making chart difficult to locate. Doctors are too often lax in entering medical information into medical record. Doctors often take excessive time to finish discharge summary. Medical record jackets sometimes get placed inside one another and are lost. One time 5 records were found inside one jacket. Anesthesia report not kept with rest of patient's medical record.
Nursing	Variability between physicians is great as related to completeness and legibility which affects MR quality. Progress notes are generally incomplete. Seem to always be filling out drug requests, at least 50 requests each day. This is a 21 bed ward. Problem with legibility of doctor progress notes. All forms generated are handwritten, including doctor's history, physical, notes, consultations; making them difficult to read, time consuming and hard to locate. Nurse seems to do a lot of unnecessary charting, writing nurses notes takes too much time.

TABLE 2.2 (cont.) Example of Problems Related to the Medical Records System Obtained in Interviews with Hospital Personnel.

THE MEDICAL RECORD	
Source of Comment	Problem
Nursing	History not available for several days because of dictation.
	Problems with obtaining history and physical prior to surgery. Doctors bring them with them so that it is only accessible at the time of surgery rather than prior to. Often information is scanty and possibly several days old.
	Biggest problem is that the medical record is not available as often as needed because doctors have them out.
	The physical size of a medical record can be so great that it is difficult to keep it in the designated slot in the nursing station.
	Doctor frequently takes patient charts to their offices making it totally unavailable on the nursing unit.
	Medical record almost never in chart rack at nursing station because doctors have them.
	Trouble retrieving medical record promptly from Medical Record Department. Many medical records lost.
Pharmacy	Terms used or abbreviations to denote drugs not legitimate abbreviations and pharmacist cannot always determine what is being ordered.
	Drug request not always filled in completely. Have to be sent back to team to be completed.

TABLE 2.2 (cont.) Example of Problems Related to the Medical Records System Obtained in Interviews with Hospital Personnel.

THE MEDICAL RECORD	
Source of Comment	Problem
Pharmacy	Mistakes made on ward in transcribing physician's order from chart to pharmacy request. Wrong drugs sent at least once a day. Since pharmacy request is a single-copy form and hence a "traveling" form, it is not always available to those who need it.

FORMS DESIGN	
Source of Comment	Problem
Nursing	Nursing staff has no voice in the design of forms used by them. Maiden name of patient not on admission slip causes confusion.
Admissions	Adult questionnaire too lengthy. Takes about 40 minutes to get through one. All the information recorded on the admisson form isn't necessary. Some of the abbreviations used on the pre-admitting form printed are not clear to patient. They do not understand what information is being requested.

TABLE 2.2 (cont.) Example of Problems Related to the Medical Records System Obtained in Interviews with Hospital Personnel.

FORMS DESIGN	
Source of Comment	**Problem**
Admissions	Many patients do not understand meaning of "third party agency" on insurance information card. Wrong (or no) information frequently supplied here by patient. People do not understand admission questionnaire contents.

OPERATIONAL PROCEDURES AND PERSONNEL	
Source of Comment	**Problem**
Medical Records Dept.	Doctors offices call Medical Records Department excessively to obtain information. As many as 50 calls per day have been received. House staff seems to be reluctant to adhere to strict Medical Records Department procedures. Medical Records Department is presently short on personnel. Turnover is a problem due to low salaries. If the Medical Records Department must transmit the complete jacket to another area within the hospital, it is sent by internal mail service, which is slow.

TABLE 2.2 (cont.) Example of Problems Related to the Medical Records System Obtained in Interviews with Hospital Personnel.

OPERATIONAL PROCEDURES AND PERSONNEL	
Source of Comment	Problem
Medical Records Dept.	When a patient no longer occupies a bed the units assume they are discharged and send documents to Medical Records Department. The patient may have been transferred to another unit and these documents are in the mail system where medical information cannot be utilized. Medical Records Department personnel must go to wards to get charts of discharged patients although hospital has internal mail services.
Nursing	Repeat of pharmacy request every three days creates unnecessary clerical work. Seems to be too many doctors for each patient.
Pharmacy	Receive requests sporadically and are not able to do best work because of peak loads.

NOTE: Table 2.2 is a composite of comments which were obtained in the course of interviews conducted in several hospitals. The reader should not be confused by conflicting comments. The composite approach is used so a greater cross-section of problems can be presented. Similarly, the Appendix to Volume I is a composite, and the interested reader is referred to that Appendix for an even broader range of comments including suggestions and trends.

communications volumes from the set of data collection forms, only the output links should be used in the computations, for the input and output links between two departments should always be equal if the communications network analysis method has been correctly applied (as explained in Section 2.2.1, page 2-7). Counting input and output links, when computing monthly totals, results in double accounting of the hospital's communications flows and yields an overestimate of the hospital's communications links and monthly volume by a factor of two.

Section 6 of Appendix A contains an example of completed data collection forms for nine hospital deparments plus communications to the outside world. The data in Section 6, Appendix A, were collected while employing the communications network analysis method in a hospital. Totals computed from these data are shown in Figure 2.6, which contains summary statistics on the total volume of medical-record-related communications and the total volume of outputs which are transported by hand, teletype, and pneumatic tube. For purposes of illustration, Figure 2.6 includes data for only three transportation modes, although the hospital in which the data were collected employed five different methods for transmitting medical record-related information Consequently, the total communications for each department does not equal the sum of the total communications for the three transportation modes given in the figure. Hand-carried communications are those communications transported by a person but not by the hospital's internal mail service, which is a separate category as shown in Figure 2.2 and in Appendix A, Section 6.

Some of the implications of the numerical results, obtained as a result of applying the communications network analysis method, are discussed in Section 2.3 of the present volume.

2.3 INTERPRETATION OF RESULTS

The problems, suggestions, and trends obtained during the interviews in the hospital departments can be subjected to direct examination by a systems analyst, hospital administrator, or medical records librarian. Often, such examination reveals changes in policies or procedures which can result in immediate improvement in the medical record system. For example, in Table 2.2, under FORMS DESIGN, the absence on the admission slip of the maiden name of

Department	Total Monthly Communications Volume	Total Monthly Hand-Carried (Output) Communications	Total Monthly Teletype (Output) Communications	Total Monthly Pneumatic Tube (Output) Communications
Pharmacy	7,650	-	-	-
X-Ray	5,112	5,112	-	-
Laboratory	13,520	-	12,660	860
Operating Room	195	-	-	195
OPD/ER	900	500	-	-
Nursing	24,093	22,383	-	-
Admissions	7,593	7,383	-	-
Business Office	7,755	-	-	-
Other (Outside World)	200	-	-	-
Medical Records	5,556	4,336	-	900
Hospital Totals	72,574	39,714	12,660	1,955

FIGURE 2.6 Example of Hospital Communications Flow Summary.

female patients is cited as a problem. The omission of the maiden name presumably causes delays in locating the medical record; correction of this problem can be easily accomplished and might be of life-saving importance in emergency cases.

Many of the problems listed under OPERATIONAL PROCEDURES AND PERSONNEL in Table 2.2 can be corrected by requiring adherence to the procedures which presumably establish controls for the use of the medical record. In such cases, the genuine interest of the administrator, medical staff, and supervisors of the hospital to improve the medical record system is required.

Some problems may indicate that a change in procedures is necessary or that a procedure should be established, such as requiring that the medical record be sent with a patient when that patient is transferred to another unit. Another problem listed under OPERATIONAL PROCEDURES AND PERSONNEL suggests that the hospital's internal mail service be used to send the patient's medical record, upon discharge, to the Medical Records Department; instituting such a practice would save considerable time of the Medical Records Department personnel, who currently make daily ward rounds to retrieve discharged patients' medical records.

From the preceding discussion, the value of an organized series of interviews, which are conducted in the various hospital departments and are concerned with the medical records system, should be evident. The formalized, semi-structured interviews tend to cause the hospital's management to attach a greater degree of significance to identified problems, suggestions, and trends, which frequently are ignored when mentioned under less formal circumstances. Furthermore, worthwhile ideas are often unexpressed except when hospital personnel are specifically requested to comment on a particular subject, such as the medical records system.

The numerical results obtained from the application of the method provide immediately useful information on the operation of the facility's medical-record-related communications system. The facility's administrator, medical records librarian, or department supervisors can determine the degree to which their functional areas contribute to the total communications flow within the facility. However, the method results often contain subtle, but valuable, information which can be uncovered by a careful examination of the data. Normally, such an examination of the data is performed by a systems analyst, since the managers and supervisors of the facility are concerned with fulfilling their everyday responsibilities and are otherwise not capable of performing the analysis due to lack of training. The systems analyst is also best qualified to recommend changes in the communications system based upon his evaluation, in terms of cost and effectiveness, of alternative systems and procedures for handling the communications flow.

The data which is collected during application of the communications network analysis method provide information on:

1. Areas of high communications activity.
2. Departments which can benefit from changes in the systems and procedures used in the preparation and transportation of departmental communications.
3. The utilization of the transportation modes which exist within the facility.

Naturally, the focus of the preliminary data analysis is the areas of high communications activity. However, since departments which generate a large volume of communications may be using very efficient methods in preparing and transmitting communications, items 1 and 2 must be considered together. For example, this point is illustrated in Figure 2.6, which shows the Nursing Units and the Laboratory to be the two major generators of the hospital's total monthly communications volume. However, 93 per cent of the output communications from the Nursing Units are transported by hand while all of the output communications from the Laboratory are transmitted via an automated method. More than 50 per cent of the hand-carried Nursing Units' outputs, however, are lab requests (see page A-46) and these requests are probably transported in batches rather than singly. Consequently, the Nursing Units' output communications are transported with a degree of efficiency which is not apparent in the summary data of Figure 2.6. Nevertheless, the failure of the nuring units to use the pneumatic tube system, which is used by other departments, is noteworthy and points to the need for an examination of the procedure for submitting a lab request.

Computation of the utilization of the available methods for transporting communications, relative to total communications volume, produces the following results for the example hospital data:

Transportation Method	Per cent of Total Hospital Communications
Hand-carried	54.6%
Teletype	17.5%
Pneumatic Tube	2.7%
	74.8%

The above three transportation methods account for approximately 75 per cent of total hospital communications volume. The remaining 25 per cent of communications are transmitted via telephone or internal mail service. Most interesting is the fact that more than half of the hospital's total communications are transported by hand by a staff member of either the sending or receiving department. This situation exists despite the existence of a pneumatic tube system (which is barely used at all), internal mail service, and, at least the beginnings of an internal teletype capability. Many of the personnel in this particular hospital cite the unreliability of the pneumatic tube system as the reason for their failure to use the system. Nevertheless, the operating room staff transports their output communications exclusively via pneumatic tube.

While the preceeding discussion by no means exhausts the analysis of the data for the example hospital, some of the communications subsystems which warrant more detailed study are identifiable, and potential opportunities for improving the communications system can be recognized. First, the specific reasons for the nearly hospital-wide failure to use the pneumatic tube system should be determined. Second, specific communication links, particularly those links which are hand-carried, should be examined to determine if the presently used transportation mode is the most appropriate in terms of cost, time, and patient-care requirements. Third, more than 50 per cent of total communications volume directly results from four communications links (see Appendix A, Section 6). These links are the pharmacy request and lab request (both originating at the Nursing Units), and the pharmacy charge slip and the lab test report. Logically, particular attention should be given to these four links in any further detailed study to improve the medical-record-related information system.

CHAPTER 3

STAFFING OF THE MEDICAL RECORD DEPARTMENT UTILIZING THE MICHIGAN METHOD

3.1 INTRODUCTION

One of the primary concerns of hospital administration and the medical record librarian, with regard to medical records, is the proper staffing level of the Medical Record Department. A second concern in the Medical Record Department is the effect on staffing of introducing new methods, equipment or rearrangement and relayout of the department.

The Michigan staffing method is a means of determining the proper staffing level for the Medical Record Department under the existing conditions within the facility. The staffing method provides the opportunity to analyze planned changes in staffing, equipment, methods or layout to determine their effect on the overall department staffing.

The staffing method is founded on the methods and standards presented in Hospital Staffing Methodology Manual MM-7 Medical Records (1). The medical record function is divided into 12 direct work operations for purposes of this study as follows:

- Record Pickup
- Record Assembly and Analysis
- Transcription
- Coding and Abstracting
- Indexing
- Numbering and Filing of Records
- Retrieval and Record Location Control
- Preparing Statistical Reports and Birth Certificates
- Incoming Phone Calls and Outgoing Calls for Missing Records
- Correspondence and In-person Information Requests
- Outpatient Records
- Emergency Room Records

These activities are defined in Section 3.1.3.

In addition to these direct work categories, the Michigan staffing method identifies the following indirect categories as performed within the Medical Record Department:

- Medical Record Administration, Supervision, Committee Work, and Education and Training
- Statistical Report Preparation
- Medico-Legal Activities
- Special Studies and/or Research Assistance

The indirect work categories are not included in the staffing method, since the method is dependent upon pre-established work standards. Such standards are difficult, if not impractical, to establish for indirect activities. Accordingly, a separate work sampling procedure was devised to analyze these indirect work categories as described in Chapter 4, Work Sampling in the Medical Record Department

3.1.1 Purpose of the Staffing Method

In general the staffing method exists to assist the hospital administrator and the medical record librarian in determining the staffing requirements for the direct work categories of a Medical Record Department. The technique can be used to analyze, evaluate, and predict the workloads within a Medical Record Department for various conditions as they exist within the facility. This program is designed to permit a hospital administrator and medical record librarian to determine what the medical record staffing should be based on the characteristics of the hospital and of the Medical Record Department. Specifically, the staffing methodology can be employed to:

1. Provide a means of analyzing the activities of a Medical Record Department.
2. Provide hospital administration and medical record supervisors with information for preparing manpower budgets and staffing reports.
3. Evaluate present staffing levels of a Medical Record Department.
4. Predict staffing changes within the Medical Record Department which might result from changes in workload, equipment, or layout.

3.1.2 Utility of the Staffing Method

The basis of this staffing method is the use of pre-established standard times required to perform basic elements of each work operation in the Medical Record Department. A standard time is defined as the time required for a qualified person working at an average pace to complete an element of work when following a prescribed and generally standardized method. The standard times in the Michigan study were derived by industrial engineers who timed the same element of work under varying conditions in many hospitals around the nation to arrive at a reasonable time standard for each element. Many industrial engineering techniques were used in the development of the staffing method; however, knowledge of the techniques is not a requisite for the use and application of the method. It should be emphasized that a great deal of time and effort is required on the part of the user in order to realize worthwhile results.

The method should be applied during a period of "normal" operations of the Medical Record Department, with as few outside or abnormal influences as possible. For instance, the method should not be applied at a time when the staff is on vacations, when new people are being trained, or when a new piece of equipment or a new method is being learned.

The staffing method can be applied in most health care delivery settings which maintain medical records. This method allows considerable flexibility in selection of sets of equations to fit the methods, procedures, equipment, and physical arrangement of department being analyzed. Where methods, procedures, equipment, or physical layout differ significantly or are not covered by equations in the staffing method, adjustments by a person qualified in industrial engineering techniques will be required.

To summarize, the staffing method can be utilized by hospital supervision in determining the proper staffing of the Medical Record Department, employing a non-industrial engineering trained person to gather data and analyze the results in most health care delivery settings.

3.1.3 Definitions of Staffing Terms

A number of terms used in the staffing method require definition for a clear understanding. These terms are defined as follows:

- A hospital Function is made up of the operations required to perform a task necessary for patient care, medical care, and hospital administration. It does not depend on departmental organization or physical location of the department within the hospital.
- An Operation is a work activity that is performed to help achieve the objectives of a Function. Examples of operations within the medical record function are numbering and filing of records, and transcription.
- An Element is a basic unit of work representing a segment of an Operation. This unit has associated with it a time value which has been established by industrial engineering work measurement techniques.
- Direct Work Operations are those operations which occur frequently and often on a regular, daily schedule. Also, these operations generally result in specific, measurable outputs.

The following activities are included in the direct work operations:

- Record Pickup - activities involving trips to pick up and sign for records and the resultant transportation time.
- Record Assembly and Analysis - preparation activities for arrangement and checking, the processing of four categories of records (newborns, obstetrics, medical, and surgical) by either Combined or Separate Assembly/ Quantitative Analysis, and the notification calls and completion of incomplete nurse records, both if done by medical record personnel.
- Transcription - activities associated with transcription including: distribution and sorting of records not completed by doctors, the assistance to doctors in completing deficient records, actual transcription of belts or discs into completed records, the re-sorting, filing, and final check of discharge records and the transportation associated with each of these activities.
- Coding and Abstracting - activities include conversion of information from the medical record into a standardized terminology; included are: setup and cleanup time, actual coding (either I.C.D.A., I.C.D.A. coding and P.A.S. abstracting combined as a single activity, or S.N.D.O. coding) used in

conjunction with the four categories outlined above under "Record Assembly and Analysis." Also included is the check of I.C.D.A. or S.N.D.O. codes with written diagnoses. The abstracting activities include setup and cleanup, actual abstracting (either on P.A.S. forms or on other types of forms), and checking of abstract statistical reports.

- Indexing - generally is the maintenance of a Master Patient Index/Card File of information taken from medical records. The card file is usually organized by patient name, doctor's name or disease name. Activities include setups, typing and filing of new cards, updating of Master Patient Index for discharges or readmissions, and optional secondary indices' activities.

- Numbering and Filing of Records - operation includes filing setups, preparation of records' folders, actual filing, updating record folders of readmissions and writing or typing admission summaries for readmissions.

- Retrieval and Record Location Control - includes determination of retrievals per day by one of three systems: using cards, slips, or outguides, using registers or logs, or using a combination of both, and locational changes of records. Retrieving times are calculated accordingly to filing systems, (e.g., "serial number-drawer file," "terminal digit-open shelf," etc.) replacement of retrieved records and updating and maintenance of existing control card file.

- Preparing Statistical Reports and Birth Certificates - activities are statistical report setups, handwriting/typing data onto data report form, filing report forms, preparation and filing of birth certificates and ancillary transportation activities.

- Incoming Phone Calls and Outgoing Calls for Missing Records - included in incoming phone calls determination: answering, recording of calls, and completion of reference calls. In outgoing calls determination: return calls, calls to doctors with delinquent records, and calls to nursing stations.

- Correspondence and In-person Information Requests - includes correspondence setups, copying and verifying requests for information, authorization of requests, sending letters to request information, answering and abstracting verified requests, and subsequent information, xeroxing, thermofaxing, or SCM electrostatic copying, re-assemblying and returning record to file, completion of form letters, bill requests, and in-person record requests.

- Outpatient Records - includes setup for processing, completion of deficient outpatient records, and filing of outpatient records.
- Emergency Room Records - includes setting up for processing, assembling and analyzing of records, ordering and filing of completed reports.
- Indirect Work Operations - are those operations which occur at infrequent intervals, have no readily measurable outputs and/or may vary procedurally from hospital to hospital.

The following activities are included in the direct work operations:

- Medical Record Administration - This operation includes activities of departmental planning, organizing, evaluation and control, personnel activities, and coordination with other hospital functions.
- Supervision - This operation includes record review and processing, secondary and permanent record files, information release, and certain transcription.
- Education and Training - This includes training new employees, instructing medical staff, training medical record librarians, and attendance at professional meetings.
- Statistical Report Preparation - This includes not only preparation of monthly reports, but also yearly and special reports.
- Medico-Legal Activities - This includes compliance with court subponea process, maintenance of current legal information and administrative advisory activities.
- Special Studies and/or Special Research Assistance - This operation includes assisting the hospital staff, and organizing/conducting studies.
- Committee Work - This includes preparation for and attendance of meetings and assistance to medical staff.

- Supply Activities - This includes requisition of supplies and the receiving of supplies.
- Other Medical Record Activities - This includes: medical library maintenance, micro file records, preparation of records for external storage, sorting and condensing of permanent files, adoption paper processing, illegitimate birth processing, other newborn document processing, other death document processing, tumor registry, miscellaneous typing, and other.

3.1.4 Principles of the Staffing Method

In order to determine the standard staff time required to perform the appropriate direct work categories for the medical record department under study, a total of 188 independent variables need to have an initial input value specified, assuming that all 12 direct work activities exist in the department under study. These independent variables are specified and defined in Appendix B, "Independent Variable Definitions" starting on page B-3. To manually apply the staffing analysis technique is laboriously prohibitive. Thus, a computer program, based directly on the set of equations of the Michigan staffing method (1), was written in Fortran IV language, can be adapted easily for use on most computers. A "Staffing Method Program Listing" is included in Appendix B starting on page B-36. A "Staffing Method Summary Flow Diagram" and a "Staffing Method Flow Diagram" are included in Appendix B starting on pages B-77 and B-79 respectively. These flow charts will assist the reader in following the logic of converting the equations of the Michigan study into computer format.

The values for the dependent variables which result from this computer program are effective measures of the required staffing for the direct work operations of the medical record function. The reader will recall that the indirect work operations are not covered by this staffing method. These dependent variables are further discussed under Section 3.2.3, "Staffing Method Results."

3.2 APPLICATION OF THE STAFFING METHOD

The value of the dependent variables which result from application of the staffing method is directly dependent upon the accuracy of the input for the independent variables. Each of the 188 possible inputs has a direct bearing on the output and cannot be regarded lightly, no matter how insignificant they may appear.

These variables can be divided into two basic types: staffing inputs and operation inputs. Staffing inputs are those variables which define the staff as it currently exists within the Medical Record Department. These variables define the time spent by the existing staff as it relates to the operations performed by the department under the prevailing conditions of method, layout, and equipment. The operation inputs define the various activities performed by the staff. These variables describe both the operations and the elements of the medical record function.

3.2.1 Data Requirements for the Staffing Method

As noted in Section 3.1.4, the independent variables for which data must be collected are specified in Appendix B, Section 4. Data collection should be performed by a person familiar with the Medical Record Department function and its relationships with other departments of the hospital. Required also is that he be well versed in the definitions and application of the subject method.

A complete set of data collection forms is located in Appendix B, Section 5, "Data Collection Input Forms," starting on page B-115.

In general, data collection should follow the sequence of steps described below:

1. Meet with the hospital administrator, the medical record librarian and other appropriate staff and discuss the staffing method with regard to input requirements and expected results.

2. Hold a brief meeting with the medical record function personnel and describe what you will be doing, what will be required of department personnel, and the expected results of the program.

3. Meet with the medical record librarian and explain the inputs which will require a multiday sample. References to multiday samples, numerical samples and yes/no answers will be explained in subsequent pages.

Explain in detail what data you want collected, how to collect it, and the forms used to record it. Leave the forms and backup material for completion with the medical record librarian.

4. After three days to a week, check the data being collected to insure for validity and accuracy. Make corrections in the data collection methods through the medical record librarian as necessary.

5. After specified time period (usually a one-month sample) return to the medical record function under study and check the desired multiday sample inputs to determine their completeness and accuracy.

6. Proceed to acquire the numerical sample inputs and the yes/no answer inputs through discussions with appropriate knowledgeable personnel within the medical record function.

7. Review the total inputs received with the medical record librarian.

The time required to collect the necessary data will vary from 15 to 40 hours depending on the knowledge and skill of the person or team doing the study and the particular department under study. This does not include the time spent by medical record function personnel.

During the data collection phase, inputs are determined for the staffing and operation inputs in both indirect and direct work categories. The input variables for the indirect work categories are covered as part of the staffing inputs to give a complete staffing picture, but as previously stated, are not part of the computerized program. The input variables for the direct work categories are covered by the remainder of the staffing inputs, plus the operations inputs, and from the inputs for the computer program.

It is the direct work categories that are of primary concern. These direct work inputs cover the Direct Work Operations performed by the particular medical record function. The direct work inputs basically fall into three types of input: those which require a multiday sample, those which require a numerical sample, and those which require a yes/ no answer.*

Those inputs which require a multiday sample are generally those items which must be counted for a period of time such as a month. These are items that the medical record function normally does not keep a record of. An example of this is the "Number of Records Filed per Month." To obtain this input would require all persons filing records to list the quantity filed each time they perform the element. A one-month sample is required.

During the initial discussion with the medical record librarian of the requirements for multiday samples, inputs to several items must be ascertained. Using the input form entitled "Use of the Independent Variable Data Collection Form," sheet 1, determine and record the major direct work operations which are performed by the medical record function These include computer variables FP1 to FP12. If the direct work operation is performed, mark the column "1 value"; if the direct work operation is not performed, mark the column "0 value," as shown in Figure 3.1

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* Multiday Sample - those inputs requiring data collection over an extended period of days; Numerical Sample - those inputs which can be counted in a short time period or those inputs that are normally recorded in the medical record function.

Hospital: A
Date: 1-7-71
Initials: JFS
Sheet: 1 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
TOTAL STAFFING:				
Total Existing Staff Time	T01A	--	--	440.00
DIRECT WORK OPERATIONS PERFORMED:				
Record Pickup	FP1		X	--
Record Assembly and Analysis	FP2	X		--

FIGURE 3.1 Use of the Independent Variable Data Collection Form

Next, by interview of the medical record librarian determine the normal workdays per week for the staff of the medical record direct work operations. This input can be recorded on the "Normal Workdays of the Medical Record Staff on Direct Work Operations" data collection form. If all staff work the same days and shift(s), this is a simple matter of recording whether the function is staffed five, six or seven days per week and one, two or three shifts per day. For example, 5D2S indicates a five-day-per-week, two-shift operation. If the 12 direct work operations are staffed during different days and hours, then each must be recorded. See Figure 3.2 for an illustration of the form usage.

Hospital: A

Date: 1-7-71

Initials: JFS

Sheet: 1 of 1

	Direct Work Operations												
	Gene-ral	I Rec Pick	J Assy Anal	K Tran	L Code Abst	M Index	N Num File	O Rec Loc Cont	P Stat BC	Q Phone	R Corr	S Out Pat	T Emer
Week: 5D1S													
5D2S	X	X	X	X	X	X	X	X	X	X	X	--	--
5D3S													
6D1S													

FIGURE 3.2 Use of the Normal Workdays of the Medical Record Staff on Direct Work Operations Form

Now determine the allocation of the existing staff to the major direct work operations areas, recording this input on the form "Existing Staff Allocation by Direct Work Operation." This is a very important part of the data collection as it forms the basis for comparison with the standard staff time developed through the computer program. Under the column "Staff Member," record the titles of all medical record function personnel, including part-time personnel. If more than one employee has the same title, list the title each time the title occurs. Then, determine the number of hours per week spent on each of the 12 direct work operations for each person on the staff by interview with the Medical Record Librarian and record on the form "Existing Medical Record Staff Allocation by Direct Work Operation." Totaling each of the columns will give the inputs for the computer inputs listed. A total of the 12 direct work operations totals gives the computer input T01A. See Figure 3.3 for an example of the form usage.

Hospital: A

Date: 1-7-71

Initials: JFS

Sheet: 1 of 1

Staff Member	Hours Worked/ Week	Direct Work Operations												
		I Rec Pick	J Assy Anal	K Trans	L Code Abst	M Index	N Num File	O Ret Loc Cont	P Stat BC	Q PN	R Corr	S Outp Rec	T Emer Rec	Other
1) Record Librarian	40.0													40.0
2) Assistant Librarian	40.0								10.0		10.0			20.0
3) File Clerk	40.0						40.0							
4) Statistician	40.0				10.0				20.0		10.0			

FIGURE 3.3 Use of the Existing Medical Record Staff Allocation by Direct Work Operation Form

A total of four sheets of the form "Multiday and Numerical Sample Inputs Data Collection Input Form" are left with the medical record librarian to record the multiday samples. These sheets allow room for recording a one-month sample for the independent variables shown. See Figure 3.4 for an illustration of the form usage.

Hospital: A

Date: 1-7-71

Initials: JFS

Sheet: 1 of 4

Number	Computer Input Variable							
	Transcription							
	K2A Month's Total Incomplete Records	K4A Total Monthly Counted Records	K6A Month's Total Deliquent Reports per Doctor	K7A Month's Belts or Discs	K8IA or K8IIA Month's Total Reports	K9IA Total Pages in 30 Reports	K10IA Month's Total Operation Diagnoses	K11IA Full Lines in 30 Pages
1	5	2	17	N/A *	1	2	18	31
2	6	3	44		18	1	30	31
3	10	--	10		18	1	29	8
4	3	2	28		12	3	23	53

* Not applicable

FIGURE 3.4 Use of the Multiday and Numerical Sample Inputs Data Collection Input Form

Those items which require a numerical sample are those items which can be counted in a single day, or are items that are normally recorded in the medical record function. An example of this is the "Number of Pages in a Newborn Patient Record." To obtain this input would require the pulling of a random sample of 30 newborn records and counting the number of pages for the latest admission. The majority of these inputs are recorded on the form "Multiday and Numerical Sample Inputs Data Collection Input Form" described previously.

However, data for the four inputs J7A, J8A, J9A, and J10A are recorded on the input form "Page by Type in the Medical Record Data Collection Input Form." This form serves the dual purpose of providing space for both the inputs listed and to record the number of pages in a sample of medical records by type for Newborn, Obstetrics, Medical, or Surgical Record. Space is also provided to record length of stay and the discharge diagnosis. This path provides sufficient information to analyze the content of the medical record and define the contents of the typical medical record for the four classes listed. See Figure 3.5 for an example of the form usage.

Hospital: A
Date: 1-7-71
Initials: JFS
Sheet: 1 of 1

Circle applicable type of record:
1. Newborn J7A 2. Obstetrics J8A 3. Medical J9A 4. Surgical J10A

Number	L* O S	Discharge Diagnosis	Pages in Last Admission													No. Admissions	Total	Comments
			Adm & Dis Sheet	Lab	X-Ray	In Hal Therapy	Physical Therapy	Nurse Notes	Progress Notes	Doctors Orders	Pathology	Chart Sheet	Flow Sheet	Other	Total			
1	3	N-Born	1	4				4		3		1		7	20	1	20	
2	4	N-Born	1	4				5		2		1		5	5	1	18	
3	2	N-Born	1	4				3	2	3		1		6	6	1	20	
4	4	C-Sect	1	4	1			5		4		2		8	8	1	25	

* LOS - Length of Stay

FIGURE 3.5 Use of the Pages by Type in the Medical Record Data Collection Input Form

Those items which require a yes/no type answer are readily available from a knowledgeable person or persons in the medical record function. These input variables are recorded on the 22 sheets of the input form "Independent Variable Data Collection Form" (described previously). Place a check under the appropriate column of "1 value" or "0 value," if the question is a yes/no question or by entering the data value under the "other value" column if the question requires a numerical answer. See Figure 3.6 for an example of the form usage.

Hospital: A
Date: 1-7-71
Initials: JFS
Sheet: 2 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
RECORD PICKUP WORKLOAD STATISTICS:				
Trips Per Day	I1	--	--	1
Pickups Per Trip	I2	--	--	4
Walked Paces Per Trip in Unobstructed Area	I3	--	--	352
Walked Paces Per Trip in Obstructed Area	I4	--	--	40

FIGURE 3.6 Use of the Independent Variable Data Collecting Form

All data should be collected from the staff member or members within the medical record function which have the greatest knowledge of the operation or element for which an input is required. In general inputs should first be sought from the medical record librarian, then her assistant, if one exists, and let them direct you to other staff as necessary.

3.2.2 Procedure for Applying the Staffing Method

The staffing method is a very simple method to apply once the data has been collected. All computer inputs which have been collected on other forms should be transferred to the "Independent Variable Data Collection Form." This data should then be checked for reasonableness and accuracy and then reviewed in detail with the medical record librarian. The next step is to transfer this data to the "Computed Input Forms," see Appendix B, Section 6. The decimal point is already entered on the form and the location must be adhered to. The user need not enter leading or trailing zeroes. Finally, input this information to the computer and have the program run.

The only problems which may arise in the application of the staffing method are a direct result of the data collection phase. If the person collecting the data does not know the medical record function intimately or does not understand the staffing method or the semantics of the independent variable definitions, serious errors may result in the data collected. A second area for error is in the "Multiday Samples." If this data is not collected in sufficient quantity and on a random basis, grave input errors may be the consequence. Similar erroneous data may result if the "Numerical Samples" are not collected in sufficient quantity on a random basis. Lastly, if the answers to "Yes/No" inputs are not received from a qualified person, additional serious data input problems may be incurred.

3.2.3 Results of the Staffing Method

The output from the computer program is in a simple format which can be obtained in three increasing degrees of detail: (a) summary of total staff requirements, (b) differences by direct work operation, and (c) details of direct work operation. An example of the output listing will be found in Appendix B, Section 7, "Sample Output Listing." For the purpose of this narrative, these outputs are shown in tabular form.

The summary of total requirements output lists (1) the total departmental standard staff time, including allowances, in man-hours per week, (2) the total existing departmental staff time in man-hours per week, and (3) the difference between existing and standard staff departmental time in man-hours per week. If the medical record function were properly staffed, and the data collection was properly conducted this difference should theoretically approach zero. However, since most departments are not perfectly staffed, and since data collection at its best is something less than perfect, this difference will be something other than zero. See Figure 3.7 for an example of this output report.

Hospital: A
Date : 5 November'70

Total Medical Record Department Staffing	Man Hours Per Week
Total Standard Staff Time	344.42
Total Existing Staff Time	440.00
Existing Minus Standard Staff Time	95.58

FIGURE 3.7 Program Output - Summary of Total Staff Requirements

The second output report, Differences by Direct Work Operation, also lists standard and existing staff time but presents these times according to the detailed operations within each of the 12 direct work operation areas. See Figure 3.8 for an example of this output report.

Hospital: A
Date: 5 November '70
Sheet: 1 of 4

Direct Work Operation	Man Hours Per Week
RECORD PICKUP	28.38
Total Standard Staff Time	40.00
Existing Staff Time	11.62
Existing Minus Standard Staff Time	

FIGURE 3.8 Program Output - Differences by Direct Work Operation

For the third output report, details of Direct Work Operation, the operations are in turn disaggregated into their basic work elements for each of the 12 direct work operations. For each element of each direct work operation this output lists the required staff time in man-minutes per day, not including allowances. See Figure 3.9 for an example of this output report.

Hospital: A
Date: 3 November '70
Sheet: 1 of 6

Element	Man Minutes Per Day
RECORD PICKUP	
Walking Time	10.00
Pushing Cart	26.03
Pickup And Sign For Records	12.54

FIGURE 3.9 Program Output - Details of Direct Work Operation

3.3 INTERPRETATION OF RESULTS

It cannot be overemphasized that valid results from this staffing method can be obtained only through diligent data collection. Thus it should be restated that accurate data collection can best be accomplished by a person with a comprehensive knowledge of medical records in general and the function under study in particular. This person must be totally familiar with the staffing method.

The results of the staffing program can be very revealing particularly when used in conjunction with the work sampling techniques described in Chapter 4. Differences between existing staff time per the medical record librarian and standard staff time per the staffing method for the direct work operations will be disclosed such that necessary corrective steps can be taken in the repetitive elements of the medical record function.

For example, the illustrative numbers listed in Figure 3.8 show the Record Pickup direct work operation to be overstaffed by 11.62 hours per week or 40 per cent overstaffed. This points up that possible inefficiencies may exist in the Record Pickup direct work operation and that the medical record librarian should review the manner in which this direct work operation is being performed in her department.

Another interpretation, which will probably reveal staffing problems in the area of indirect work operations, is the comparison of the input by the Medical Record Librarian or the allocation of the medical record department staff with the results of this program. First determine the amount of time per employee not accounted for by the staffing method by subtracting the total time for the direct work operations per the program output listing from the total available staff time. This difference is then compared with the input under "other" on the "Existing Medical Record Staff Allocation by Direct Work Category" data collection input form. Differences between these figures indicate time not allocated to either direct work operations per the staffing method nor in the opinion of the medical record librarian to indirect work operations. Differences are due to inefficiency on the part of the employee in performance of the assigned direct and indirect work operations. A check of the time allocated to indirect work categories by the medical record librarian may be desirable where significant inefficiency is revealed. The methods described in Chapter 4 on work sample provide one tool for making this check.

Inputs for the independent variables can be made for anticipated changes in equipment, layout, or methods. The resultant output can then be compared with the standard staff time for existing conditions as a guide to determining the optimum combination of equipment, layout, methods, and personnel.

LITERATURE CITED

(1) Bartscht, Karl G., Wayne H. Smith, Steven P. Gray, and William F. Howard, Hospital Staffing Methodology Manual MM-7 Medical Records, Hospital Systems Research Group, University of Michigan, January 1968, 478 pp.

CHAPTER 4

WORK SAMPLING IN THE MEDICAL RECORD DEPARTMENT

4.1 INTRODUCTION

There are many situations in which sampling studies can be valuable in generating information for hospital decision making. For example, a decision maker may need to know how much nursing personnel time is devoted to each of several types of activities. Or, he may require information on the frequency of medication errors in order to determine the proper drug distribution policy.

Many do not realize that everyday decisions are based upon the decision maker's conscious or unconscious sampling of pertinent variables. The medical examination is essentially a sampling process: the doctor tentatively diagnoses the patient's condition by observing the characteristics of a limited number of accessible body areas. Sampling blood, tissue, and urine is so common, it is easy to overlook the fact that this is sampling in the truest sense of the term. The nurse relies heavily upon periodic contacts with the patient to form professional judgments about the type of care he will require throughout the day; the department head bases his assessment of employees' performance upon intermittent contacts with them, and the administrator evaluates the fiscal status of the institution by considering only a few of the many economic indicators that may have been developed (2, pp. 238).

In the hospital's Medical Record Department sampling is a logical technique to utilize when trying to assess how resources are consumed. Since most hospital medical record departments expend the major portion of their resources on personnel salaries, an economic analysis of this department should center on how personnel allocate their time on the job.

4.1.1 Purpose of the Method

Work sampling is a fact finding technique which can be used to gather accurate information concerning how time is utilized in the

Medical Record Department. The purpose of work sampling can be many-fold; it can help in studying: (1) time lost to bottlenecks, delays, and interruptions, (2) the efficiency of a Medical Record Department, and (3) the distribution of workloads and duties among medical record employees.

Utilization of a formal work sampling plan in the Medical Record Department will, if properly designed and executed, provide information on how departmental staff uses its time and what percentage of staff time is expended in the various work activities of the department. Such information can then serve as a basis for making management and planning decisions about how the manpower resources of the Medical Record Department are expended. Moreover, a properly designed sampling plan which minimizes mistakes can result in a rational balance between the costs of collecting information and the expected costs of an ill-advised decision due to insufficient data.

4.1.2 Utility of the Method

Determining the utilization of personnel in the Medical Record Department via work sampling is not very practical for very small departments (e.g., 1-4 employees). The application of work sampling in small departments is difficult for three reasons. First, the number of work observations required may necessitate too long a study period (see 4.2.2). Secondly, a full-time person may not be available to become totally involved for the duration of the sampling study. Thirdly, because the departmental workload is not standardized (i.e., each person is not always responsible for the same tasks) some potential improvements revealed through work sampling (see 4.3) may not be feasibly implemented. To a lesser degree, these same study difficulties apply to intermediate departments (e.g., 5 -8 employees), while large departments (e.g., 9 or more employees) have the potential to utilize work sampling most effectively.

The principles of work sampling are straightforward and relatively easy to apply. One person can conduct the study and determine the results from the sampling data. The only skill necessary to apply the work sampling technique presented herein is the ability to use basic arithmetic.

However, there are dangers in using a simplified sampling technique. First, the technique, due to its simplicity, may be "loosely" applied to the Medical Record Department thereby introducing bias into the work sampling data collected. Second, the assumptions made to simplify the technique may be ignored when the results are interpreted, thereby possibly invalidating the results. Potential dangers of both types are mentioned as appropriate in the development of this chapter.

4.1.3 Definitions

To insure clarity of presentation throughout this chapter, the following definitions are given below: (adapted from reference 2, pp. 239-240)

1. Work Sampling - Work sampling is a technique for studying human work activities based upon the instantaneous observations of these activities at different points in time. At the appropriate observation time, a worker is observed, and his activity is classified into one of several previously defined work activities and the classified activity is then recorded. From the final number of observations in each work category, inferences can be drawn concerning the distribution of work activities. If the sample is properly selected, these inferences have increased validity because properly selected samples tend to be distributed in the same manner as members of the population from which the samples are taken.

2. Random Sampling - Random sampling is the randomization of observation times in a work sampling study such that each point in time has an equal chance of being part of the sample.

3. Accuracy - The accuracy of a work sampling result refers to how close the result is to the "right answer" in terms of the size of the percentage range around the answer.

4. Absolute Error - The absolute error of a work sampling activity percentage refers to the absolute range about the "right answer" (whereas accuracy refers to the percentage range about the right answer). If, for example, the measured activity percentage was 20 percent and an accuracy of 10 percent was desired, the absolute error range would be 18% to 22%, computed as

18% = (0.20 - 0.10 x 0.20) x 100% and 22% = (0.20 + 0.10 x 0.20) x 100%. This error range is the expected or measured activity percentage plus and minus the absolute error (the activity percentage times its accuracy).

5. Confidence Level - The confidence level refers to the percentage of time the sample activity percentage is expected to be within the error range. In reference to the above example's "accurate" sample activity range (i.e., 18 to 22 percent), a confidence level of 90 percent means that a work sampling estimate of that activity's work time percentage would nine times out of ten fall in the range of 18 to 22 percent, if the work sampling procedure were to be repeated ten times.

4.1.4 Principles of Work Sampling

Random work sampling consists of instantaneous observations made only at random intervals, rather than continuous all-day observations (for other kinds of sampling see reference 2, p. 290). Random sampling requires that there is no bias in the sampling process. The objective herein is to gain insight into the percentage of time that different medical record activities occur. Because medical record activites normally are regularly recurrent, i.e., occur at approximately the same hourly, daily, or weekly time (s), it it important that the sampling time does not coincide with any regularly recurring activities. Therefore it is essential that any observation time possibility have an equal chance of being used as any other point in time. If this essential requirement is not met by randomly selecting observation times, it is impossible to draw accurate conclusions about medical record activities from work sampling results.

The number of sample observations, as well as the random nature of these observations, also affects the accuracy of conclusions drawn from a work sampling study. The larger the number of observations, the higher the degree of accuracy, other things being equal. However, the degree of accuracy desired for the inferences to be drawn and the level, or degree, of confidence for these inferences are separate considerations. The accuracy of an inference refers to how close it is to the "right answer" in terms of the size of the percentage range around the answer; the level of confidence refers to the percent of time the sample estimate is expected to be within that range (2, pp. 240). The relationship of accuracy and confidence level to the number of sample observations is given by the following equation (adapted from 1, pp. 519-525):

$$AP = C\sqrt{\frac{P(1-P)}{N}}$$

where: A = desired relative accuracy percentage, expressed as a decimal.

P = percentage of one activity's observations compared to the total number of observations, expressed as a decimal.

C = coefficient of confidence. This constant is the number of standard deviations about the mean P. The corresponding interval about P is known as the confidence interval. The percentage of samples (medical record activity percentages) that are expected to fall within the confidence interval is given by the confidence level. When C = 1, confidence level, (CL), $\simeq$ 68 percent; when C = 1.65, CL $\simeq$ 90 percent; when C = 2, CL $\simeq$ 95 percent.

N = total number of random observations (N = frequency of observations times the number of workers observed times the length of study).

4.2 APPLICATION OF WORK SAMPLING IN THE MEDICAL RECORD DEPARTMENT

Utilization of work sampling in the Medical Record Department consists of the following activities:

1. Determining what work categories are to be studied.
2. Estimating or conducting a preliminary survey to determine the department's percentage of time spent in these work categories.
3. Determining the proper sample size for the work sampling study.
4. Collecting work sampling observation data.
5. Counting the frequency of work category observations.
6. Drawing conclusions from the data.

4.2.1 Data Requirements

There are only two types of data required to use the work sampling technique in the Medical Record Department. The first is an initial determination of the percentage of departmental staff time devoted to each work activity. This determination is made by a brief, preliminary sampling survey or, less desirably, is made by obtaining the medical record librarian's estimate of the percentages for the work activities. These preliminary values are utilized in Equation 4 (see section 4.2.2) to determine the study sample size; therefore, care must be taken to insure that the cyclical variation in these initial activity percentages are accounted for. Valid activity percentages cannot be determined from a preliminary survey of work activities of even 2,000 Mondays, if there is a significant change in the workload pattern on Tuesdays. Cyclical work activity variations must be included in the initial activity percentage determinations. The initial survey must cover a sufficient time span, or the medical record librarian's initial activity estimate must be sufficiently accurate, to insure that the initial activity percentages are reasonable values.

The second type of data required for the work sampling study are the N work activity observations. These observations must be categorized according to a predetermined medical record activity classification scheme. A "general" activity classification scheme has to be developed for work sampling in the Medical Record Department. This scheme, shown in Table 4.1, is only a suggested activity classification. It may be desirable to change this categorization scheme after consideration of the following two items:

1. It is absolutely necessary that observation time be minimal. Theoretically it is desirable for observation time to be zero, hence the phrase "instantaneous" observation; however, adherence to a maximum allowable observation time limit of about one minute will usually enable all observation times to be randomized (see 4.2.2, Step 7b). Since the number of workers observed and the number of activity classifications into which an observed activity is categorized both affect observation time (time to observe workers plus the time to categorize and record the observation), the large number of activity classes in Table 4.1 may dictate too much activity categorization time, especially in large departments. (Actually, in this regard the physical layout of the department and the geographical dispersion of

TABLE 4.1 · Definition of Work Sampling Activities in the Medical Record Department

A - Administrative

01 Medical Record Administration: This operation includes activities of departmental planning, organizing, evaluation and control, personnel activities and coordination with other hospital functions.

02 Supply Activities: This includes requisition of supplies and the receiving of supplies.

03 Committee Work: This includes preparation for and attendance of meetings and assistance to medical staff.

04 Special Studies and/or Special Research Assistance: This operation includes assisting the hospital staff, and organizing/ conducting studies.

05 Clerical I: Working with discharge summary and other EDP reports.

06 Clerical II: General typing and miscellanious clerical activities.

07 Miscellaneous Administrative

08 Telephone

C - Classification and Analysis

09 Record Assembly and Analysis: Preparation activities for arrangement and checking, the processing of four categories of records (newborns, obstetrics, medical, and surgical) by either Combined or Separate Assembly/Quantitative Analysis, and the notification calls and completion of incomplete nurse records, both if done by medical record personnel. Including insertion of items into medical records and checking on incomplete records.

10 Indexing: Indexing, generally, is the maintenance of a Master Patient Index/Card File of information taken from medical records. The card file is usually organized by patient name, doctor's name, or disease name. Activities

TABLE 4.1 (cont.) Definition of Work Sampling Activities in the Medical Record Department

include setups, typing and filing new cards, updating of Master Patient Index for discharges or readmissions, and optional secondary indices' activities. Yellow cross index file and blue record location file.

11 Coding: Activities include conversion of information from the medical record into a standardized terminology; included are: setup and cleanup time, actual coding (either I.C.D.A., I.C.D.A. coding and P.A.S. abstracting combined as a single activity, or S.N.D.O. coding) used in conjunction with the four categories outlined above under "Record Assembly and Analysis." Also included is the check of I.C.D.A. or S.N.D.O. codes with written diagnoses.*

12 Abstracting: The abstracting activities include setup and cleaning, actual abstracting (either on P.A.S. forms, or on other types of forms), and checking of abstract statistical reports and insurance.

D - Record Distribution

13 Activities involving trips to pick up and sign for records and the resultant transportation time including off floor time.

14 Filing and retrieving medical records.

15 Checking library catalog of records checked out.

E - Education and Training

16 This includes training new employees, instructing medical staff, and attendance at professional meetings.

17 Training of medical record librarian

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* P.A.S. - Professional Activity Study
I.C.D.A. - International Classification of Diseases, Adapted
S.N.D.O. - Standard Nomenclature of Diseases and Operations

TABLE 4.1 (cont.) Definition of Work Sampling Activities in the Medical Record Department

O - All Outpatient Activities

18 Everything pertaining to Outpatient Department

T - Transcription

19 Activities associated with transcription including: distribution and sorting of records not completed by doctors, the assistance to doctors in completing deficient records, actual transcription of belts or discs into completed records, the re-sorting, filing, and final check of discharge records and the transportation associated with each of these activities.

N - Non-productive

20 Idle and talking non-business

21 Personal time (breaks and lunch)

22 Off-floor - not work related

X - Can't Locate

W - Walking

employees may also dictate an upper limit on the number of workers that can be observed.) Consequently, the number of activity classes in Table 4.1 might have to be reduced and modified in order to reduce observation time or, alternatively, additional observers may be used to make and record observations.

2. Consistent interpretation of the activities defined in Table 4.1 can be difficult because the distinctions between the activity classifications are not well-drawn. For example, a work sampling observer may, at times, have difficulty in distinguishing between record distribution (Activity Number D-13) and transportation of typed reports (Activity Number T-19). Inconsistencies of this nature may bias and therefore distort the accuracy of the work sampling. Modification of Table 4.1 by each Medical Record Department utilizing this work sampling technique can eliminate inconsistent activity classifications.

4.2.2 Procedure for Applying the Method

Table 4.2 is a complete procedure list for applying work sampling in the Medical Record Department. The eight steps in Table 4.2 are only brief statements of the total process, consequently each step's description is amplified here, and an example calculation is given.

Step 1. Section 4.1.4 introduced the following equation to relate the sample size, N, to accuracy, A, and coefficient of confidence, C, for each individual medical record activity percentage, P (see all activities in Table 4.1).

$$AP = C\sqrt{\frac{P\ (1-P)}{N}} \qquad 1.$$

Solving this equation for N gives:

$$N = \frac{C^2\ (1-P)}{A^2\ P} \qquad 2.$$

When using Equation 2 to calculate the work sampling size, N, it is normal to fix the accuracy, A, and the coefficient of confidence, C, at desirable levels. The values for A and C used herein are A = .10 and C = 1.65

TABLE 4.2 Procedure Steps for Applying Work Sampling in the Medical Record Department

1. Conduct a preliminary survey to determine initial activity percentages, p, for all medical record activities (i different categories).

2. Disregard all p values less than .10.

3. Determine the required work sampling sizes for all p values greater than .10 from the equation:

$$N = \frac{272\ (1-p)}{p}$$

4. Choose the largest N from Step 3.

5. Determine the workers to be observed, E.

6. Determine the time period D over which the study is to be conducted.

$$D\ (\text{hours}) = \frac{N}{10E}$$

7. Collect work sampling data for E workers for D hours as follows:

   a. Fill out the heading information on the Work Sampling Data Form (WSDF), Table 4.3.

   b. Determine the random observation time.

   c. At the proper observation time, enter the proper one or three character abbreviation of the employees' activity on the WSDF.

8. Calculate for each work sampling activity category its percentage of the total observations, N.

$$P_i = \frac{\Sigma Q_i}{N} \times 100\%$$

Where:

D = Study Duration

E = Employees Observed

i = Work Sampling Activity Category

N = Sample Size

Q = Individual Work Sampling Observation

P = Measured Activity Percentage (decimal value)

p = Initial Activity Percentage (decimal value) (corresponding to an accuracy of 10 per cent and a confidence level of 90 per cent, respectively). Using these normal values for A and C, Equation 2 now becomes:

$$N = \frac{272\ (1-P)}{P} \qquad 3.$$

Note however, that Equation 3 cannot be used to calculate N until P is known, yet the reason for doing a work sampling study of N observations is to accurately estimate P. This obvious inconsistency can only be circumvented by initially estimating, or determining from an initial sampling study, a preliminary P (preliminary P is designated p). Customarily p is estimated by the medical record librarian rather than determining p by an initial sampling study. Step 1 in Table 4.2 is determining a p value for all medical record activities.

Example: Suppose it is desired to determine the activity percentages for the nine major medical record activity classifications in Table 4.1 (major classifications are designated by a letter while minor activities are denoted by a letter followed by a two digit number): A, C, D, E, O, T, N, X, and W. (The activity classifications in Table 4.1 are only "general" and are utilized here for illustrative purposes only). The medical record librarian's initial estimate, the per cent of personnel time spent in each of these activities is as follows:

Activity	Initial p Expressed as a Decimal
A	Pa = .20
C	Pc = .30
D	Pd = .15
E	Pc = .05
O	Po = .00
T	Pt = .15
N	Pn = .05
X	Px = .05
W	Pw = .05
	Total =1.00

Step 2. A sample size, N, is calculated for each activity, p, with the selected N being the largest N so calculated. For small p's, the

calculated N is quite large. Because large N's mean a longer and more time consuming study for the required precision (required accuracy and confidence), all p's less than .10 are disregarded. (This cut-off p value can be varied to reflect a concern for study cost and the number of activities being sampled.)

Example: Disregarding all p's less than .10 leaves the following activities and corresponding p's.

Activity	p Values
A	Pa = .20
C	Pc = .30
D	Pd = .15
T	P5 = .15

Step 3. Using Equation 4 (see Step 1 above) a sample size is calculated for each p.

$$N = \frac{272\ (1-p)}{p} \qquad 4.$$

Example: Calculating a sample size N for each p yields the following values of N.

Activity	Necessary Sample Size N to Determine Final P
A	Na = 1088
C	Nc = 635
D	Nd = 1542
T	Nt = 1542

Step 4. Choose the largest N in Step 3.

Example: The largest N is Nd or Nt, 1542 observations.

Step 5. Determine the number of workers to be observed, E. E should not exceed approximately 10-15 employees; otherwise, work sampling observations require too much time, and the observation times may not be random (see Step 7b below).

Example: The number of employees to be sampled is 8 or E = 8.

Step 6. Determine the time period over which the study is to be conducted.

$$D \text{ (hours)} = \frac{N}{10E}$$

Example:

$$D = \frac{1542}{10(8)}$$

$$D = 19.3 \text{ hours}$$

Step 7. Collect work sampling data for the D study hours. This is done in the following steps.

a. Fill out the proper number of Work Sampling Data Forms (WSDF), see Table 4.3. The required information consists of day, shift, and employees' names, and identification numbers.

b. Determine the random observation time. The first observation is taken whenever data collection is started. Thereafter, the time till the next observation is randomized by the second hand of a wrist watch or clock. Before an observation is made, the watch is observed, and the hour to which the second hand is closest represents the number of minutes till the next work sampling observation. Thus, there is an equal probability that any of 12 digits (corresponding to the 12 hours on the watch face) is the number of minutes between observations. This increment is added to the present time and the result, the next observation time, is then entered on the data form. On the average, the interval between observations is the median of the 12 possibilities or 6 minutes; which means there are an average of 10 observations per hour.

Because there is a possibility that consecutive observations may be separated by as little as one minute (1 of the 12 possibilities), it is necessary for observation time to be minimized. If observation time is not less than a minute (caused by widely separated employees or too many employees being observed), the observations are no longer randomized, i.e., the observations no longer have an equal probability of occurring at any time. If the observations are not random, the work sampling results are not valid.

TABLE 4.3 Work Sampling Data Form

Date________________

Shift________________

Employee I.D. / Obs. Time															

c. At the recorded observation time, the employees are observed and their activities are recorded on the WSDF. This activity entry is the one or three-character abbreviation corresponding to major or minor activity classifications of the observed sampling activities consistent with the abbreviations in Table 4.1.

Example: Table 4.4 is a WSDF filled out per the nine activity categories consistent with this example. The observation times have been randomized, and the interval between times ranges from 1 to 12 minutes.

Step 8. Calculate from all WSDF's the activity percentages for all medical record activities. This entails summing for each activity category its number of observation abbreviations recorded on the WSDF's and dividing that sum by N. The equation for this calculation is:

$$P_i = \frac{\Sigma Q_i}{N} \times 100\%$$

Where Q = an individual activity observation

i = a medical record activity classification

Example: Assume that the filled-out WSDF, Table 4.4, covers the required study period of 19.3 hours (see Step 6 above). Actually Table 4.4 covers only about two hours; if all the data were available, 10 WSDF's would be required to cover the proper time period. However, if the 160 observations in Table 4.4 covered a sampling period of 20 hours, then the final results would be calculated as follows:

1. The following data would be obtained from the WSDF (by counting):

Total observations for A = ΣQ_a = 46 observations

Total observations for C = ΣQ_c = 34 observations

Total observations for D = ΣQ_d = 9 observations

Total observations for E = ΣQ_e = 10 observations

Total observations for O = ΣQ_o = 0 observations

Total observations for T = ΣQ_t = 25 observations

Total observations for N = ΣQ_n = 16 observations

Total observations for X = ΣQ_x = 6 observations

Total observations for W = ΣQ_w = 14 observations

Total=160

TABLE 4.4 Work Sampling Data Form Completed

Date 5-17-71

Shift 8 to 5

Employee I.D. / Obs. Time	Name Smith	Brown	Simpson	Grant	Hill	Jones	Shelby	Wilson							
	No. 1	2	3	4	5	6	7	8							
7:59	A	C	C	N	A	T	T	T							
8:11	A	C	N	N	A	T	T	T							
8:20	A	C	W	C	A	T	T	T							
8:26	A	A	A	A	A	A	A	A							
8:27	A	A	A	A	A	A	A	A							
8:33	A	A	A	A	A	A	A	A							
8:39	A	C	C	C	A	T	T	T							
8:46	W	C	C	N	C	T	T	D							
8:56	A	C	C	C	C	T	T	D							
9:01	A	N	W	C	C	W	T	D							
9:04	A	N	C	C	W	N	T	D							
9:07	A	C	C	C	C	N	N	D							
9:16	X	C	C	N	C	T	T	D							
9:24	X	C	C	C	A	A	A	D							
9:29	X	C	W	W	A	A	A	D							
9:35	W	C	E	E	W	N	T	D							
9:44	A	N	E	E	W	W	T	N							
9:45	A	W	E	E	C	T	T	N							
9:52	A	W	E	E	C	N	T	X							
9:54	A	W	E	E	C	X	N	X							

2. The following results are statistically correct with an accuracy of 10 per cent and a confidence of 90 per cent because the final activity percentages are greater than 10 per cent (see Section 4.2.2, Step 2).

   - A (administration) % = 46/160 x 100% = 28.7%
   - C (classification and analysis) % = 34/160 x 100% = 21.2%
   - T (transcription) % = 25/160 x 100% = 15.6%
   - N (non-productive) % = 16/160 x 100% = 10%

3. The following results are not statistically correct with an accuracy of 10 per cent and a confidence of 90 per cent (because the final activity percentages are less than 10 per cent) although the results are indicative of the true per cent of personnel time spent in each activity.

   - D (record distribution) % = 9/160 x 100% = 5.6%
   - E (education) % = 10/160 x 100% = 6.3%
   - O (outpatient) % = 0/160 x 100% = 0%
   - X (cannot locate) % = 6/160 x 100% = 3.8%
   - W (walking) % = 14/160 x 100% = 8.4%

4.2.3 Method Results

The results of applying work sampling in the Medical Record Department are the calculated activity percentages, P's, determined from Step 8, Table 4.2. Thus a statement can be made about the percentage that each medical record activity is of the total activities done in the Medical Record Department. Additionally, this percentage sample result, P, if greater than or equal to 10%, can be said to have an accuracy of 10% and confidence level of 90% associated with it (see Section 4.2.2, Step 8).

Note that if a large number of calculated P's were less than or equal to 10% (in the previous example 5 of the 9 P's were less than 10%) few statistically correct results can be drawn (in the example only four). This situation can be changed by reducing the initial p cut-off value from 10% (see Table 4.2, Step 2) to a lower value. Reducing the initial p cut-off value would increase the number of statistically correct results but require a longer work sampling study. Since the initial p determination is quite important, (initial p's fix sample size and therefore can influence the accuracy and confidence of the final results) it is recommended that a half day sampling study be done to better determine these initial p values. An initial half day preliminary sampling is especially helpful if the number of activities in the work sampling study is large, thereby making the individual estimated p's smaller and therefore the accuracy of the individual p's more critical to a "reasonable" sample size determination.

Sample calculated activity percentages appear in Table 4.5*. Note that the activity percentages, the calculated P's, are converted to activity man-hours per day. If man-hours per day were multiplied by the proper medical record personnel salaries, the result would be the amount of salary dollars spent for each medical record activity. This dollar result can certainly be helpful in ascertaining how to best utilize medical record manpower resources.

4.3 INTERPRETATION OF RESULTS

If the man-hour figures from Table 4.5 are converted to dollars, the results may alert decision makers to those activities where changes in procedures, policies, or personnel responsibilities may be necessary to more effectively utilize departmental resources. In this sense, work sampling is a management tool which can be useful to the medical record librarian and/or the hospital administrator. However, the applicability of work sampling is not limited to analysis of ongoing activities.

Work sampling can be used, as the University of Michigan Staffing Methodology can be used, to plan for future staffing requirements. This planning application would involve an extrapolation of present activity hours to future activity levels. If the expected future activity "hours" are sizable, then the medical record decision maker may wish to investigate basic operational changes in the department. For example, the activity,

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* These results are consistent with the results of the example in section 4.2.2.

TABLE 4.5 Medical Record Activity Percentages for a Hypothetical Medical Record Department.

Activity	Activity Percentage*	Man-Hours per Day**
Administrative	28.7	18.4***
Classification & Analysis	21.2	13.6
Record Distribution	5.6	3.5
Education & Training	6.3	4.0
Non-Productive	10.0	6.4
Outpatient Activities	0	0
Transcription	15.6	10.0
Walking	8.9	5.7
Could not locate	3.8	2.4
Total	100.1	64.0

* Sample accuracy is 10 percent while confidence level is 90 percent for all percentages greater than or equal to 10 percent.

** Based upon 8 medical record employees working an eight-hour day.

*** 18.4 administrative man-hours per day was determined as follows:

1. 8 total men x 8 hours per day = 64 total man-hours per day.
2. .287 (percent as decimal) of total time spent in administration x 64 total man-hours per day = 18.4 administrative man-hours per day.

record distribution, may be more logically absorbed by another part of the hospital's organization in the future, such as the mail department. Or manual record distribution may be eliminated by an automated communication or materials handling system. Potential personnel-equipment cost trade-offs for the complete or partial elimination of a manual record distribution system can be, in part, determined from extrapolated work sampling results. Another similar work sampling application area is to evaluate personnel-equipment cost trade-offs for an automated medical record filing system. In general, work sampling can be useful whenever the question, how personnel time is being utilized--productively or non-productively--is pertinent to the effective management of an existing or planned Medical Record Department.

The discussion of the application of work sampling in the Medical Record Department, to this point, has focused upon the average activity percentages for all employees during all time periods. However, the work sampling technique is not limited to this specific type of application. Information concerning the work activities of a particular subgroup of medical record employees, such as transcriptionists, may be desirable for establishing productivity, and therefore wage standards, for example. Or, information concerning how activity percentages (particularly non-productive) vary hourly can assist in scheduling medical record personnel.

Regardless of the type of information to be obtained from a work sampling study, it is essential that the work sampling study be planned with a specific information objective in mind. The example calculations presented in this chapter had, as their objective, to determine with a given accuracy and confidence the average activity percentages for all employees during all time periods. The number of required observations originally calculated were based upon this objective. It is true that the data collected could be sorted and summed to determine activity percentages for specific employees or specific time periods. However, the original sample size calculations were based upon the initial p estimates consistent with the original study objective. Had the objective been to identify work activity percentages for a particular group of medical record employees or for a particular time period rather than for all employees for all time periods, the sample would have to be larger.

The increased sample size is due to the initial p's associated with a subset (i.e., less than the total set or group) of employees or time periods being smaller than the p values associated with the total set of employees or time periods.

Unless the estimated p values are consistent with the conclusions to be derived from the work sampling study, no accuracy and confidence level statements can be made about those conclusions. In essence, planning the work sampling study is as important as conducting the study; for once the study objectives (and therefore p values and sample sizes) are fixed, the conclusions that can be made with the desired accuracy and confidence are also fixed.

LITERATURE CITED

(1) Barnes, R. M., Motion and Time Study and Measurement of Work, John Wiley & Sons, Inc., New York, 1966.

(2) Smalley, H. E., and John R. Freeman, Hospital Industrial Engineering, Reinhold Publishing Corporation, New York, 1966.

CHAPTER 5

OBSERVATION TECHNIQUES ON THE NURSING WARD

5.1 INTRODUCTION

The nursing station is the temporary repository for active inpatient medical records. Physicians, nurses, students, and aides continually record data in the medical records, extract information from them, and use them for teaching purposes. When a patient is discharged, the record is completed and sent to the Medical Records Department as a permanent report. The medical record is critical to patient care and a great deal of time and effort is involved in using and maintaining it. It is important, then, that patient records on the nursing ward be used as efficiently and effectively as possible.

5.1.1 Purpose of the Method

In developing an optimal method for using medical records on the ward, the first step is to document how the existing system is presently working. This can be done in three ways: using a sign-out and sign-in sheet, work sampling, or direct observation.

If a sign-out sheet is used, ward personnel (physicians, nurses, aides) must record how and when they use any record they pull. While no one from outside the unit is required to conduct the study, unit personnel are burdened with extra work. Also, the data gathered may not be extremely accurate since personnel often forget or are too busy to fill out the data sheet. In work sampling, random observation is used to study records. This technique circumvents the problems of extra work for unit personnel and incomplete data, but it does not produce enough detailed data.

Direct observation is based on round-the-clock or eight-hour monitoring of ward medical records by an individual from outside the ward who is familiar with the personnel, procedures, and layout of the unit being studied. The direct observation method requires more observation time and is more costly than work sampling, but the added accuracy and detail make this method the most desirable.

5.1.2 Utility of the Method

The technique of directly observing medical records can be used in outpatient clinics, emergency wards, doctors' and dentists' offices, convalescent homes, old age homes, and medical records departments, as well as in nursing wards. In fact, the basic concept can be used in any place handling records and meeting the following conditions:

1. The records should be stored in a single location.
2. Records should be in individual folders for filing and identification purposes.
3. Records should be used in a specific area, preferably in a very limited area such as a chart room.
4. The area where the records are stored and used should be convenient for observation.

While the study technique can be used even if all these requirements are not met, the study becomes easier and the data gathered are more accurate if the guidelines are followed.

5.1.3 Definitions

In discussing the observation techniques used on the nursing ward, several terms should be defined:

- The chart identification number is the unique number on each medical record which indicates a particular patient. It may be used in analysis to determine how many times the same chart was pulled and whether or not all charts were pulled.
- The Level of Dependency describes each patient in terms of the level of care he demands:
- Complete Care. The patient, while possibly able to feed himself, is unable to wash or otherwise take care of himself. The patient will possibly have a private duty nurse and is generally not allowed out of bed.
- Normal Care. The patient requires a nurse's assistance in getting to the bathroom and sometimes during bathing. While the patient may be ambulatory, he is restricted to his room and may have a private duty nurse.

- Light Care. The light care patient is usually completely ambulatory and can take care of such tasks as feeding and washing himself.
- Duration of time the record is out of the chart rack indicates the amount of time elapsed from when the chart is pulled until it is replaced in the rack or returned to the nursing station.
- Persons using medical records include: (1) physicians; (2) nurses; (3) nurse aides; (4) ward clerks; and (5) nursing students. Medical students are classified as "physicians."
- The destination of the record during its use may be: (1) the nursing station; (2) both the nursing station and the patient's room; (3) the patient's room only; or (4) another department or a floor other than the one where the patient's room is located.
- The method of record usage determines why the chart is pulled. The following categories are used: (1) read and write; (2) write; (3) read; (4) input hard copy; (5) extract hard copy.

5.2 APPLICATION OF DIRECT OBSERVATION ON THE NURSING WARDS

5.2.1 Data Requirements

The data required for analysis include:

- The time each record is pulled
- When the record is returned
- Each patient's level of dependency
- Who used the record
- Why the record was removed
- Where the record was used.

5.2.2 Procedure for Applying the Method

One observer at each nursing station must stand near the chart rack and use a specially designed form (Figure 5.1) to record data for each record pulled from the chart rack.

Pg. ____ of ____

MEDICAL RECORDS STUDY

Hospital ____________

Date ____________

Shift ____________

Observer ____________

Record I.D.#	Level of Dependency			Time			Person Using					Destination								Purpose						Comments
	C	N	L	Out Ⓑ	In Ⓕ	△	Doctor	Nurse	LPN	Student		Charting Area	Dr. Office	Nursing Station	Patient Room	N.S. & Pat. Rm.	Off Floor	Unknown		Write	Input	Extract	Read	Read & Write	Input & Extr.	
612 Ⓐ		1	Ⓗ	0652	0655	3		✓	Ⓒ			✓	Ⓓ										✓	Ⓔ		
604			1	0652	0659	7				✓		✓										✓				
647A		1		0652	0659	7		✓				✓											✓			
641A		1		0653	0659	6	✓							✓									✓			
621	1			0653	0700	7			✓			✓								✓						
612		1		0659	0706	7		✓				✓												✓		

FIGURE 5.1 Sample Data Collection Form

The observer first fills in the top portion of data collection form for identification purposes. When a medical record is removed from the rack, the observer writes in the record identification number (Figure 5.1, Item A) and the time the record was removed (Item B). A check mark is made in the column indicating the person using or removing the record (Item C). Where and why the record is used are also checked (Items D and E). The time the record is returned to the rack is recorded under "Time-In" (Item F). The time the record was being used is entered in the "Time-Δ" column (Item G), either at the time the record is returned or later. "Time-Δ" is simply the difference between the "Time-Out" and "Time-In" columns. The "Level of Depencency" can be recorded (Item H) either when the record is taken out of the rack or at a later time; if a listing is made out daily by the nursing staff, this entry can be made at the end of the day.

In the example shown in Figure 5.1, Medical Record #612 for a normal care patient was pulled at 6:52 a.m. by a nurse. She read it in the charting area and returned it three minutes later at 6:55 a.m.

The information obtained from the observation sheets can be analyzed either manually or with a computer. Appendix C, Section 1, contains a computer program written in Fortran IV for use on United Computer Systems' Time-Shared Services. Samples of the computer output are shown in Appendix C, Section 2.

Several occurrences at the nursing station may affect data collection:

1. Occasionally, a chart may be taken from the chart rack, used, and left at the nursing station, without being replaced in the chart rack. In such cases, the observer should log the chart "In" because, in effect, the chart is no longer in use.
2. If charts are removed from the nurse's station and not returned by the end of the day, data entries should be deleted from the computations for "average duration of use" since no check-in time can be clocked.
3. Entries for charts in use an exceptionally long time should also be deleted from the data collection. For example, private duty nurses frequently prefer to keep the chart in the patient's room while they are on duty. These cases should be noted, however,

since they represent the length of time the record is not readily available to others. Exceptionally long periods of usage for charts which accompany patients to areas such as surgery and X-ray should be noted since these are considered normal usage of the chart.

4. When a chart is taken to a patient's room, there may be some uncertainty about how the chart was used. If the chart, when returned, is marked with doctor's orders, it should be assumed that data were entered in the chart and this information should be recorded under the "Purpose of Use" category.
5. Occasionally, one person may pull several charts at the same time and later return all of them simultaneously. This "batching" is generally done to enter routine information in several records. In such cases, the average usage time per chart may be determined by dividing the total usage time for all records by the number of charts pulled.

It should be noted that the time the record is out of the rack does not necessarily equal writing time or reading time. The chart holder's travel time from the nursing station to the patient's room, personnel non-productive time during possession of a chart, and patient's time in surgery and X-ray are all included in duration time, and they are clearly not representative of actual charting time. However, since the "Duration of Use Time" figure is a representation and indicates the accessibility of the chart to other users, it has substantial value.

5.2.3 Method Results

The data collected at the nursing station may be organized to illustrate a number of relationships. Several of these relationships are listed below, and examples of them may be found in the tables which follow:

1. Location of chart utilization, by person (Table 5.1)
2. Number or percent of records pulled, by type of person, by level of care (Table 5.2)
3. Average utilization time per record, by type of person (Table 5.3)
4. Percentage of records pulled, by reason (Table 5.4)

TABLE 5.1 Location of Chart Utilization -- Physician and Nurse

Data Set Identification	Total Chart Pulls by Physician	Percentage Distribution -- by Destination				Total Chart Pulls by Nurse	Percentage Distribution -- by Destination			
		Nurse Station (NS)	NS and Patient Room	Patient Room	Off Floor		Nurse Station (NS)	NS and Patient Room	Patient Room	Off Floor
1	87	75%	0%	24%	1%	114	100%	0%	0%	0%
2	67	90	2	6	2	230	99	0	0	1
3	68	59	16	25	0	97	98	0	2	0
4	67	85	3	12	0	175	97	1	1	1
5	69	49	28	23	0	124	94	2	2	2
6	56	54	25	19	2	90	98	1	1	0
7	72	84	8	8	0	185	98	1	1	0
8	66	54	17	29	0	112	93	2	3	2
9	67	67	22	11	0	189	99	0	1	0
10	45	75	18	7	0	65	87	2	5	6

TABLE 5.2 Chart Pulls by Patient Level of Care

Patient Category	Total Patients		Total Pulls		Chart Pulls by Person														Chart Pulls by Purpose											
					Dr.		Nurse		LPN		Aide		Clerk		Student		Other		Write		Input		Read		Read/Write		Input/Extr		Other	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Complete	11	20	88	19	9	14	41	18	7	30	4	33	8	29	11	16	3	38	50	20	6	21	17	18	5	18	2	-	1	-
Normal	11	20	92	21	21	32	49	21	1	5	2	17	5	18	11	16	2	25	40	16	7	25	24	25	9	33	1	-	1	-
Light	33	60	265	60	36	54	142	61	15	65	6	50	15	53	46	68	3	37	156	64	15	54	55	57	13	49	5	-	3	-

TABLE 5.3 Average Time Per Chart Pull by User

Nursing Unit Size (No. of Beds)	Average Time Per Chart Pull (in minutes)					Sample Size	
	Physician	Nurse	Aide	Clerk	Student	No. of Records	No. of Hospitals
0 - 19	16	1	20	12	4	499	2
20 - 29	17	1	33	2	1	502	3
30 - 39	10	1	2	3	3	962	3
40+	10	1	4	4	5	4768	2
Type of Nursing Unit							
Medical	15	1	10	4	4	3391	7
Surgical	10	1	23	9	0	3340	5

TABLE 5.4 Percentage of Nurse Chart Usage by Purpose

Nursing Unit Size (No. of Beds)	Nurse Chart Usage							Sample Size	
	Read & Write	Write	Read	Input	Extract	Other	Total	No. of Records	No. of Hospitals
0 - 19	16%	65%	13%	0%	0%	5%	100%	124	2
20 - 29	20	52	16	5	0	6	100	202	3
30 - 39	38	32	17	6	3	4	100	423	3
40+	53	28	16	1	1	1	100	2124	2

5. Average frequency of chart pulls, by user (Table 5.5)

6. Average frequency of records pulled, by time of day (Table 5.6)

7. Average number of records pulled, by user per day (Table 5.7)

By making the study a more detailed and comprehensive one, it would also be possible to determine the usage of individual parts of the medical record by person, by time, and by area of use.

Table 5.7 presents one way of determining the number of chart pulls, per patient, per day in:

- Teaching hospitals (2 units)
- Large non-teaching hospitals (3 units)
- Small (under 40 bed) non-teaching hospitals (2 units)

An example of a graphic presentation of how medical records are used, by time of day, appears in Figure 5.2. Two peak periods of usage are shown: one between 8:00 a.m. and 10:00 a.m. and a much bigger one between 2:00 and 3:00 p.m.

Very skewed distributions may be exhibited when the length of time the chart is used is plotted. In most instances, the chart is in use less than two minutes. Figure 5.3 is a sample histogram of chart use times by the day of the week on a surgical unit in a large non-teaching hospital. There are no apparent changes in the use time pattern by day. Figure 5.4 shows the same type of pattern for two days on a medical unit in the same hospital.

The amount of time the chart is used by nurses during a five day period is shown in Figure 5.5. The time pattern is the same for patients in each of the patient care classifications.

In Figure 5.6 a one-week observation for a nursing unit shows the length of time the chart was being used, plotted by time of day. The data show that as the day progresses (7:00 to 3:00 -- the day shift hours) the time use profile gets shorter hour by hour until it reaches a minimum between 2:00 and 2:59.

5.3 INTERPRETATION OF RESULTS

Analyses based on the data collected may be used to determine the cost/effectiveness of automated communication equipment such as teletypes, pneumatic

TABLE 5.5 Average Frequency of Chart Pulls by User

Nursing Unit Size (No. of Beds)	Frequency of Chart Pulls						Sample Size	
	Physician	Nurse	Aide	Clerk	Student	Total	No. of Records	No. of Hospitals
0 - 19	33%	31%	15%	17%	3%	100%	499	2
20 - 29	21	41	9	28	1	100	502	3
30 - 39	20	47	2	27	3	100	962	3
40+	18	51	10	12	9	100	4768	2
Type of Nursing Unit								
Medical	22%	42%	9%	22%	5%	100%	3391	7
Surgical	21	47	9	15	8	100	3340	5

TABLE 5.6 Average Frequency of Chart Pulls by Time of Day

Nursing Unit Size (No. of Beds)	Time of Day								Sample Size	
	7-8 a.m.	8-9 a.m.	9-10 a.m.	10-11 a.m.	11-12 a.m.	1-2 p.m.	2-3 p.m.	Total	No. of Records	No. of Hospitals
0 - 19	12%	18%	11%	15%	9%	10%	25%	100%	499	2
20 - 29	10	22	15	7	12	14	21	100	502	3
30 - 39	10	17	20	9	12	12	21	100	462	3
40+	14	18	16	14	8	10	20	100	4653	2
Nursing Unit Type										
Medical	9%	16%	18%	10%	11%	11%	24%	100%	3391	7
Surgical	16	20	14	13	9	11	18	100	3225	5

TABLE 5.7 Number of Chart Pulls Per Patient Per Day

Hospital	All Persons			Physicians			Nurses		
	Complete	Normal	Light	Complete	Normal	Light	Complete	Normal	Light
Teaching Hosp (2)	8.786	5.529	6.9	3.143	2.118	2.307	1.929	1.294	1.7
Largest Non-Teaching Hosp (3)	6.718	6.114	6.143	1.063	1.023	1.000	3.594	2.250	2.214
Under 40 Beds (2)	13.222	5.480	14.182	1.333	.640	1.636	6.333	2.920	6.455
All Hospitals	8.309	5.7325	6.082	1.636	1.012	1.429	3.6181	2.256	3.061

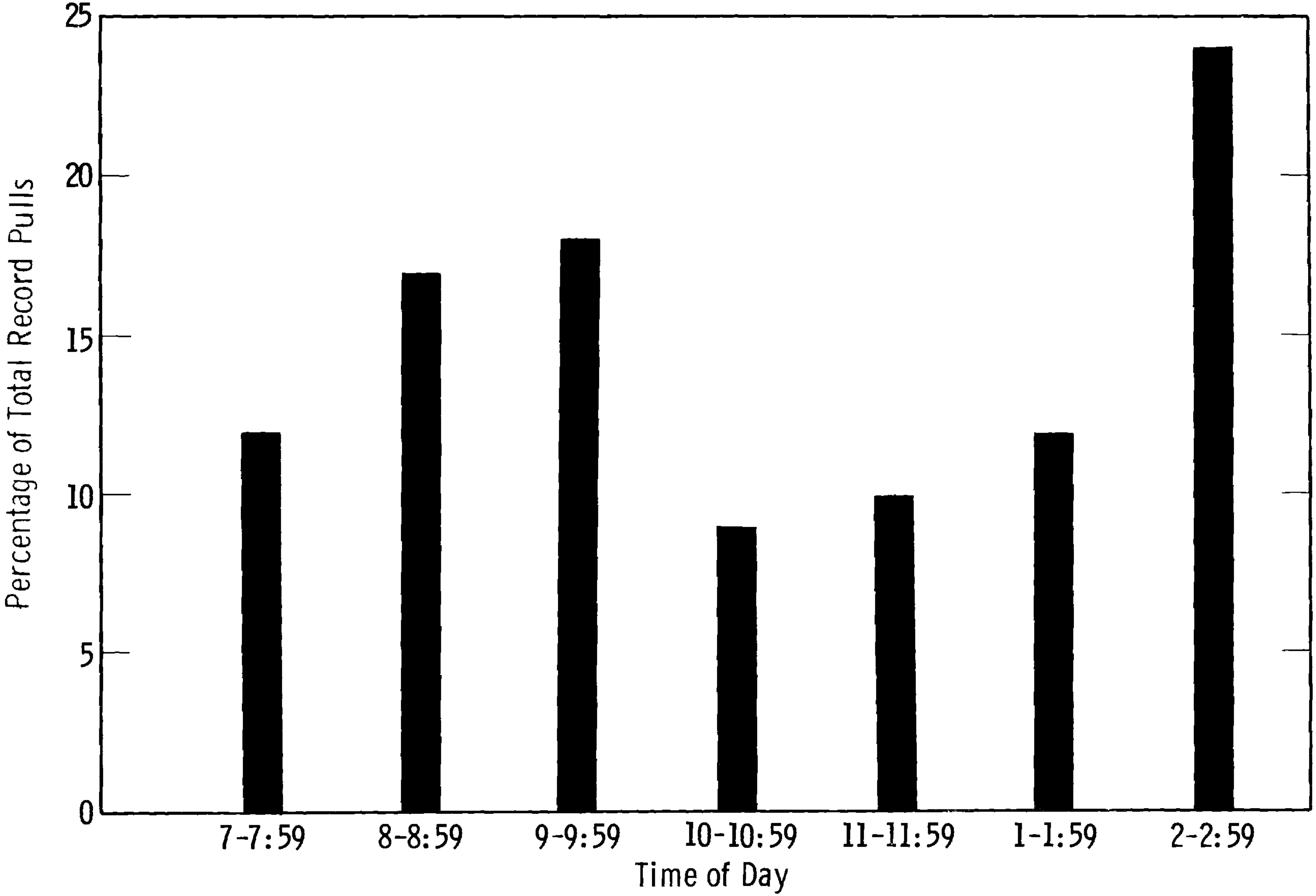


FIGURE 5.2 Medical Record Use by Time of Day

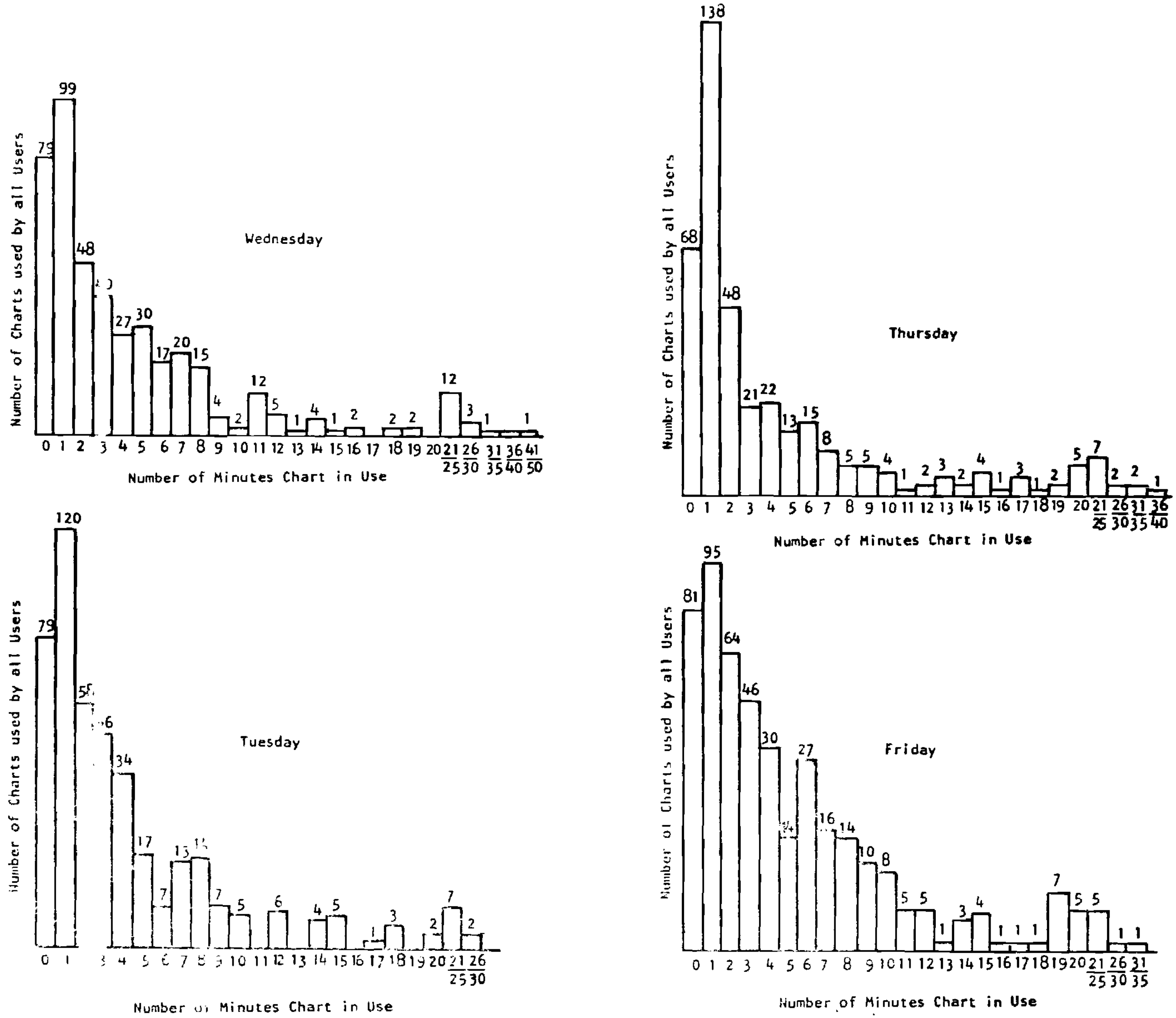


FIGURE 5.3 Duration of Chart Usage -- All Users by Day of Week -- Surgical Unit

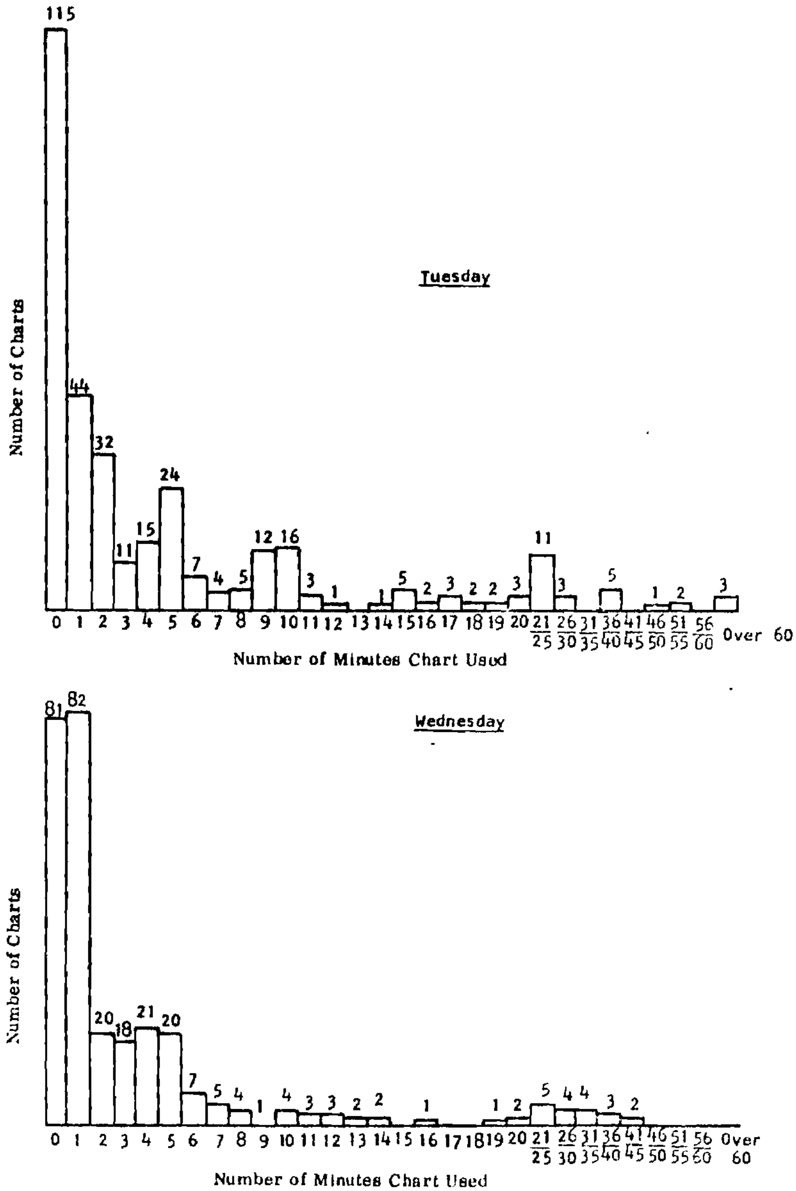


FIGURE 5.4 Duration of Chart Pulls -- All Patients, All Users -- Medical Unit

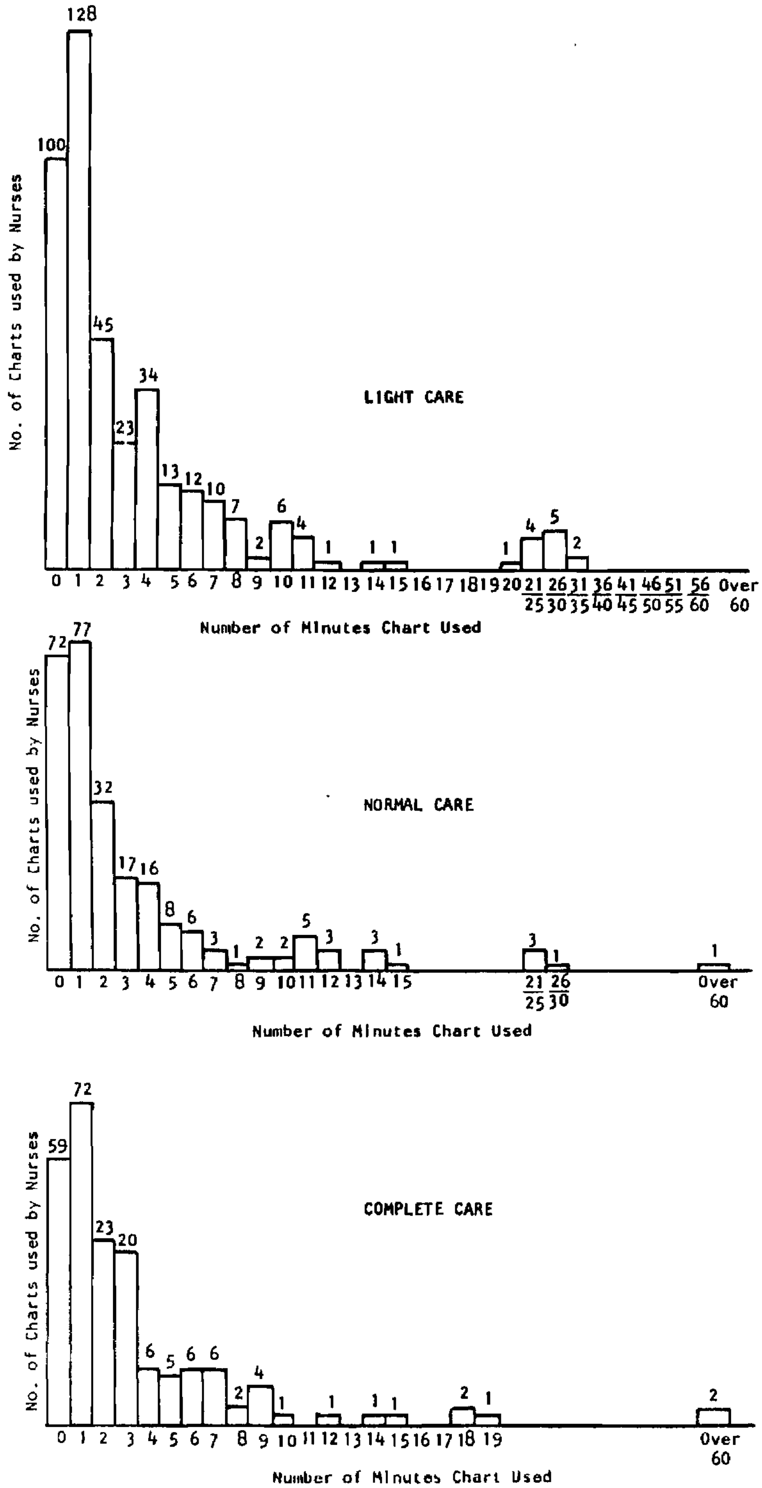
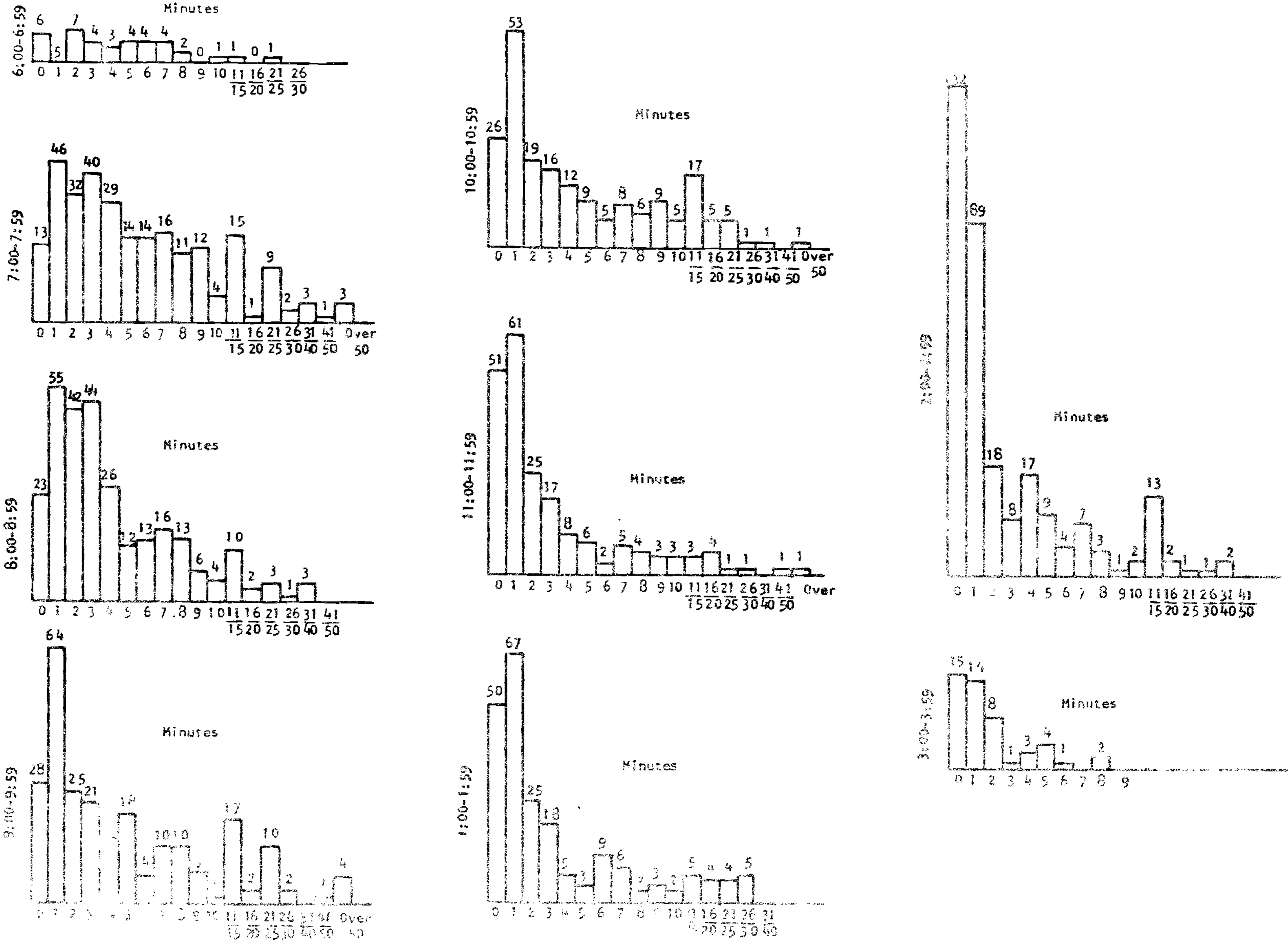


FIGURE 5.5 Nurse Time with Charts by Level of Care



6:00-6:59
Minutes
7:00-7:59
8:00-8:59
Minutes
9:00-9:59
Minutes
10:00-10:59
Minutes
11:00-11:59
Minutes
1:00-1:59
Minutes
Minutes
3:00-3:59
Minutes

[illegible]

tubes, or computer terminals. Information on the number of times records are used by different types of medical personnel at a given time can be used to determine the number of automated devices, the performance characteristics, and system improvement capabilities needed. An analysis of why the record is used could reveal the type of equipment needed. For example, should the system merely display the record information, or must it also have capabilities for entering data? "Time of day" and "place of use" information quantifies peak loads of record usage and so may be used to reveal the number of communication devices needed at given locations.

In addition to their use in developing new hardware systems, the data collected can be used to improve existing systems and procedures. For example, it might be possible to reduce the peak medical record workloads during the day by eliminating the rigid time schedule for certain activities, such as scheduling patients for X-ray. Another possibility would be changing the method of entering data in the medical record to reduce the large workload at the end of the day.

APPENDIX A

Appendix to Chapter 2

CHECKLIST FOR CAPSULE INTERVIEWS

CHECKLIST FOR CAPSULE INTERVIEWS

Date: ____________________ Interviewer: ____________________

Hospital: ____________________ Interviewee: ____________________

Ideas/Problems/Trends

Additional Information Needed (What/How Often/From Whom?)

INFORMATION / /

____ Quicker response time

____ Availability

____ Access

____ Lost

____ Promptly entered

____ Accurate

FORMS (REPORTS) / /

____ Simplified

____ Eliminated

____ Readable

PROCEDURES/ORGANIZATION / /

____ Simplified

____ Eliminated

____ Quickened

____ Added

EDUCATION/TRAINING / /

____ Trends/Changes

____ Problems

____ Suggestions

RECENT CHANGES / /

____ Medical Record Department

____ Laws (Medicare-Medicaid/Abortion)

(CONT.)

CHECKLIST FOR CAPSULE INTERVIEWS (Cont.)

RECENT CHANGES (cont.)

_____ Physician Committees

_____ Your Department (Organization/Equipment)

TRENDS /___/

_____ Forms

_____ Patient Care

_____ Laws

MEDICAL RECORD CONTENT /___/

_____ Dated

_____ Authenticated

_____ Standard Symbols

_____ Admitting Diagnosis Present

_____ Medical Record Uses (Physician Decision-making/Research/Education/ Evaluation)

_____ Progress Notes

_____ Nurses' Notes

_____ Sequence of Medical Record Content

_____ Legibility

_____ Too much Information

_____ Too little Information

_____ Information too Late

HISTORY AND PHYSICAL EXAM /___/

_____ Always included

_____ Who Obtains (may obtain)

_____ Time Limit for Becoming part of Medical Record

_____ Standard Proof Forms Used

SECTION 2

FORMS DEFINING ANTICIPATED COMMUNICATION LINKS

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		PREP MODE HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
Adm & Sum Sheet			Adm																		
Adm Form			Adm																		
Adm Form			ER																		
Bus Ofc Jacket			Bus Ofc																		
Dy Pt Census			Adm																		
Dy Pt Census			Adminis																		
Dy Pt Census			NS																		
Medical Record			Adm																		
Medical Record			NS																		
Medical Record			Outs Cl																		
Medical Record Req			NS																		

MEDICAL RECORDS DEPARTMENT

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE: HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		PREP MODE: HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs: PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
Medical Record Req			Outs Leg																		
Req for MR Info			Outs Leg																		
Req for MR Info			Outs Ins																		
Req for MR Info			Dr																		
OR Report			NS																		
OR Report			OR																		
OR Report			Outs																		
MR & Tiss Committee Form			Adminis																		
Lab Reports			Lab																		
Lab Reports			NS																		
X-Ray Report			X-Ray																		

MEDICAL RECORDS DEPARTMENT

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
X-Ray Report			NS																		

NURSING SERVICE

COMMUNICATION LINK NAME			FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs			REMARKS
	INPUT	OUTPUT			HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME	COPIES/FROM	
Medical Record			MR																		
Medical Record			Adm																		
Medical Record			X-Ray																		
Medical Record			NS																		
Adm Slips			Adm																		
Disc Slip			Adm																		
Disc Slip			MR																		
Req for Medical Record			Dr.																		
Req for Medical Record			OR																		
Req for Medical Record			MR																		
Req for Medical Record			X-Ray																		

NURSING SERVICE

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE: HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		PREP MODE: HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs: PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
Typed Hist & Phys			Dr.																		
Typed Hist & Phys			MR																		
Req for Lab			Lab																		
Lab Results			Lab																		
Req for X-Ray			X-Ray																		
Radium Therapy Req			X-Ray																		
Pharm Req			Phar																		
Pharm Narcotic Req			Phar																		
X-Ray Results			X-Ray																		
Dy Pt Cond & Census			MR																		
Dy Pt Cond & Census			Adm																		

ADMISSIONS OFFICE

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
Adm Form			Bus Ofc																		
Adm Form			NS																		
Adm Form			MR																		
Adm & Disc Sum			NS																		
Adm & Disc Sum			MR																		
Adm & Disc Sum			Bus Ofc																		
Medical Record			NS																		
Medical Record			MR																		
Req for Medical Record			MR																		
Req for Beds			NS																		
Blue Cross Bill			Bus Ofc																		

ADMISSIONS OFFICE

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
Group Hosp Ins			Bus Ofc																		
Group Hosp Ins			NS																		
Bill for Medicare Pt			Bus Ofc																		

BUSINESS OFFICE

COMMUNICATION LINK NAME			FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs			REMARKS
	INPUT	OUTPUT			HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME	COPIES/FROM	
Bus Ofc File			MR																		
Blue Cross Bill			Outs Ins																		
Blue Cross Notifica			Outs Ins																		
Medicare App Req			Outs Ins																		
Medicare Bill			Outs Ins																		
Medicare Bill			Pt																		
Group Ins Bill			Outs Ins																		
Group Ins Bill			Pt																		
Group Hosp Ins Form			Outs Ins																		
Adm & Disc Sum			NS																		
Adm & Disc Sum			MR																		

BUSINESS OFFICE

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE: HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER	PREP MODE: HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs: PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
X-Ray Req			X-Ray																	
X-Ray Req			NS																	
Lab Req			Lab																	
Lab Req			NS																	
Pharm Req			Pharm																	
Pharm Req			NS																	

CLINICAL AND PATHOLOGY LABORATORY

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
Lab Req			MR																		
Lab Req			NS																		
Lab Req			OR																		
Lab Req			ER																		
Lab Req			Clinics																		
Lab Results			MR																		
Lab Results			NS																		
Lab Results			OR																		
Lab Results			ER																		
Lab Results			Clinics																		
Pathology Reports			MR																		

CLINICAL AND PATHOLOGY LABORATORY

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE: HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		PREP MODE: HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs: PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
Pathology Reports			NS																		
Pathology Reports			OR																		
Pathology Reports			ER																		
Pathology Reports			Clinics																		
Req for Lab Info			MR																		
Req for Lab Info			NS																		
Req for Lab Info			OR																		
Req for Lab Info			ER																		
Req for Lab Info			Clinics																		
Lab Billing Chits			Bus Ofc																		

RADIOLOGY DEPARTMENT

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
X-Ray Req			NS																		
X-Ray Req			OR																		
X-Ray Req			ER																		
X-Ray Req			Clinics																		
X-Ray Req			Dr.																		
X-Ray Results			MR																		
X-Ray Results			NS																		
X-Ray Results			OR																		
X-Ray Results			ER																		
X-Ray Results			Clinics																		
X-Ray Therapy Req			NS																		

RADIOLOGY DEPARTMENT

COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
X-Ray Therapy Req			Clinics																		
X-Ray Info			MR																		
X-Ray Info			NS																		
X-Ray Info			OR																		
X-Ray Info			Clinics																		
X-Ray Info			Dr.																		
Req for X-Ray Info			MR																		
Req for X-Ray Info			NS																		
Req for X-Ray Info			OR																		
Req for X-Ray Info			ER																		
Req for X-Ray Info			Clinics																		

RADIOLOGY DEPARTMENT

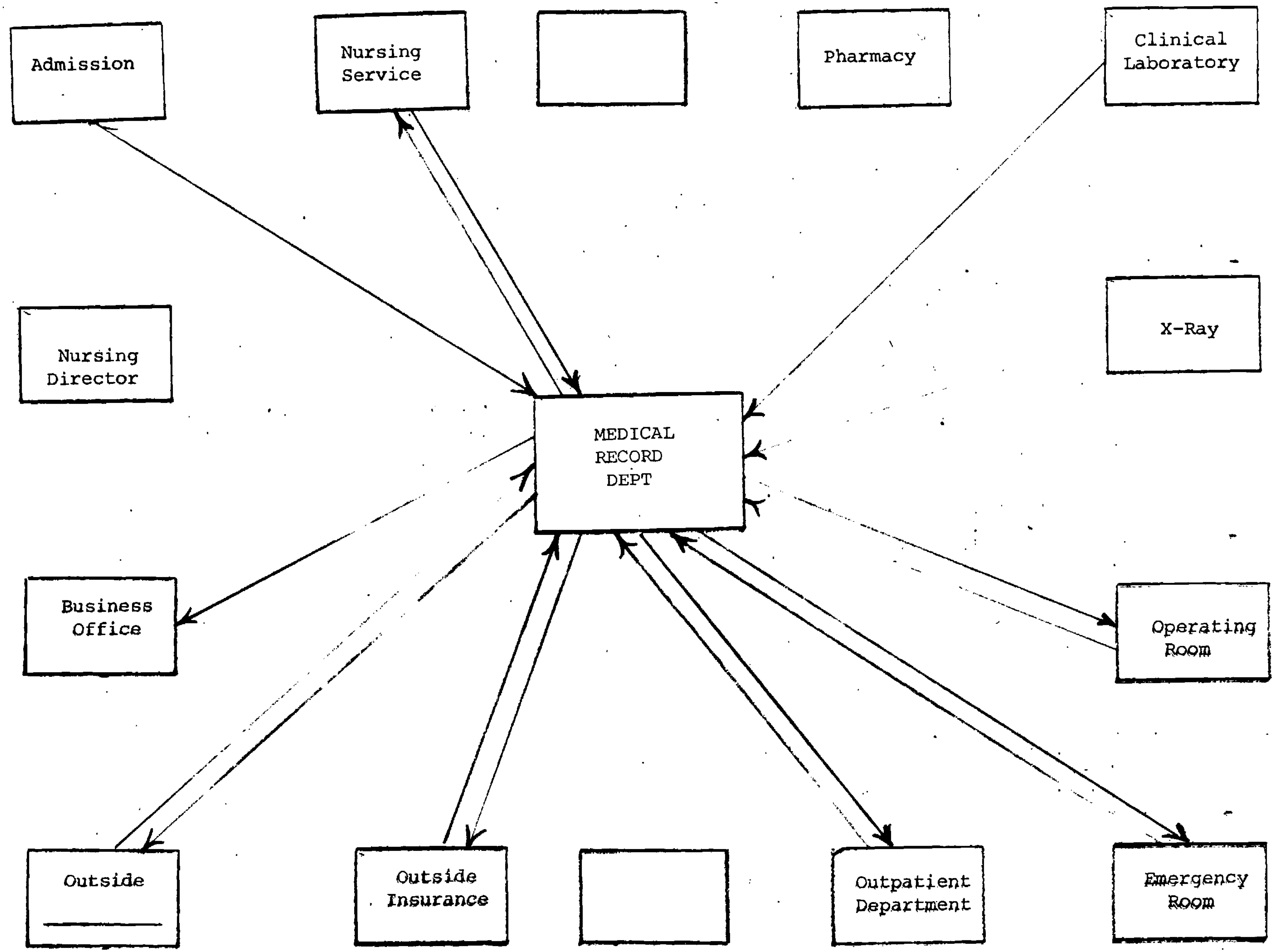
COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE: HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		PREP MODE: HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	DEC. HRs: PREP TIME	QUEUE TIME	COPIES/FROM	REMARKS
Req for X-Ray Info			Dr.																		
X-Ray Chits			Bus Ofc																		

PHARMACY DEPARTMENT

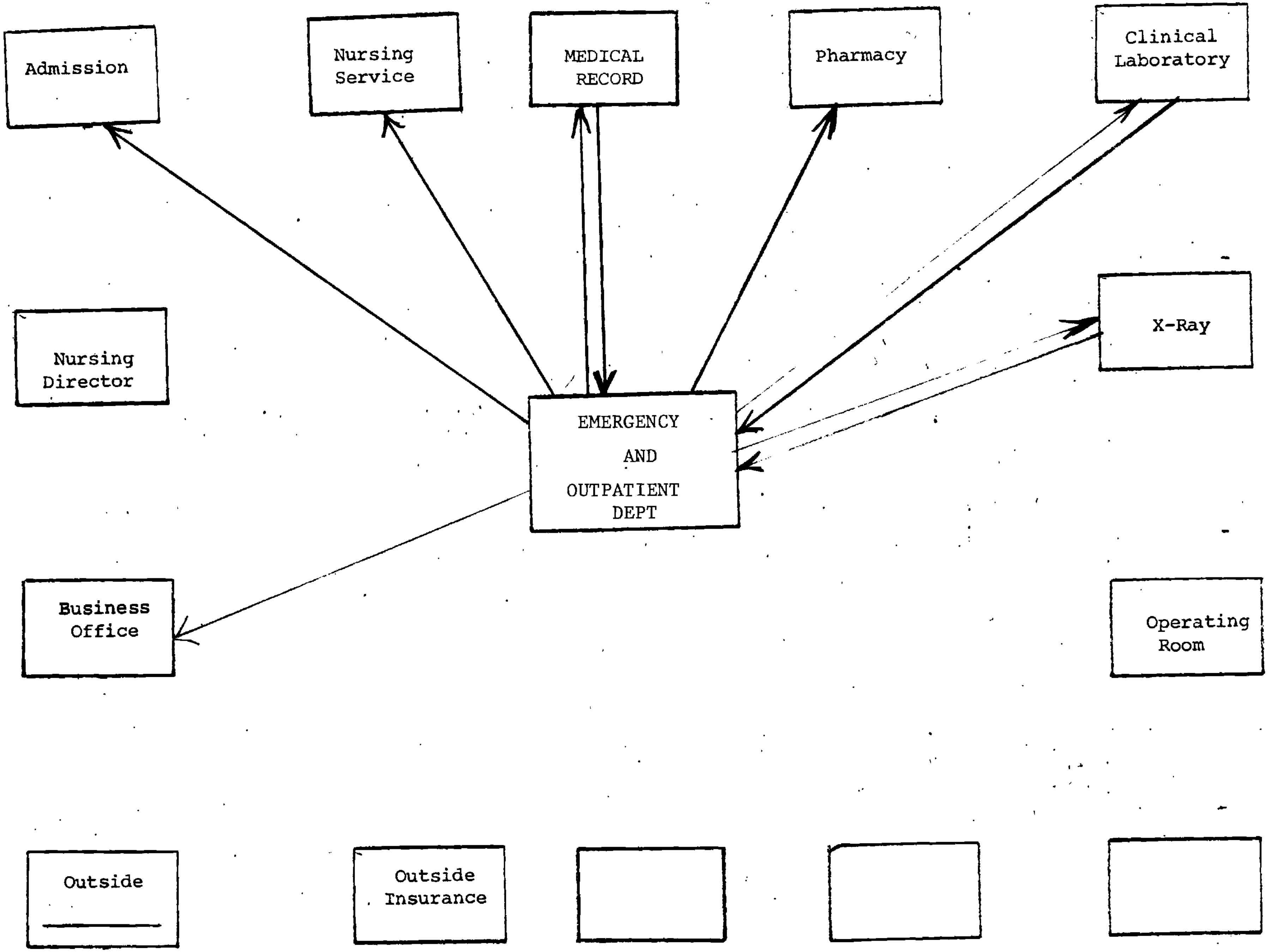
COMMUNICATION LINK NAME	INPUT	OUTPUT	FROM OR TO	MONTHLY VOLUME	TRANS MODE								PREP MODE					DEC. HRs		COPIES/FROM	REMARKS
					HAND	MAIL	PNEUMAT.	DUMBW.	TELEPHONE	TELETYPE	OTHER		HANDW.	TYPED	COMPUTER	PRE-REC	OTHER	PREP TIME	QUEUE TIME		
Pharm Req			NS																		
Pharm Chit			Bus Ofc																		

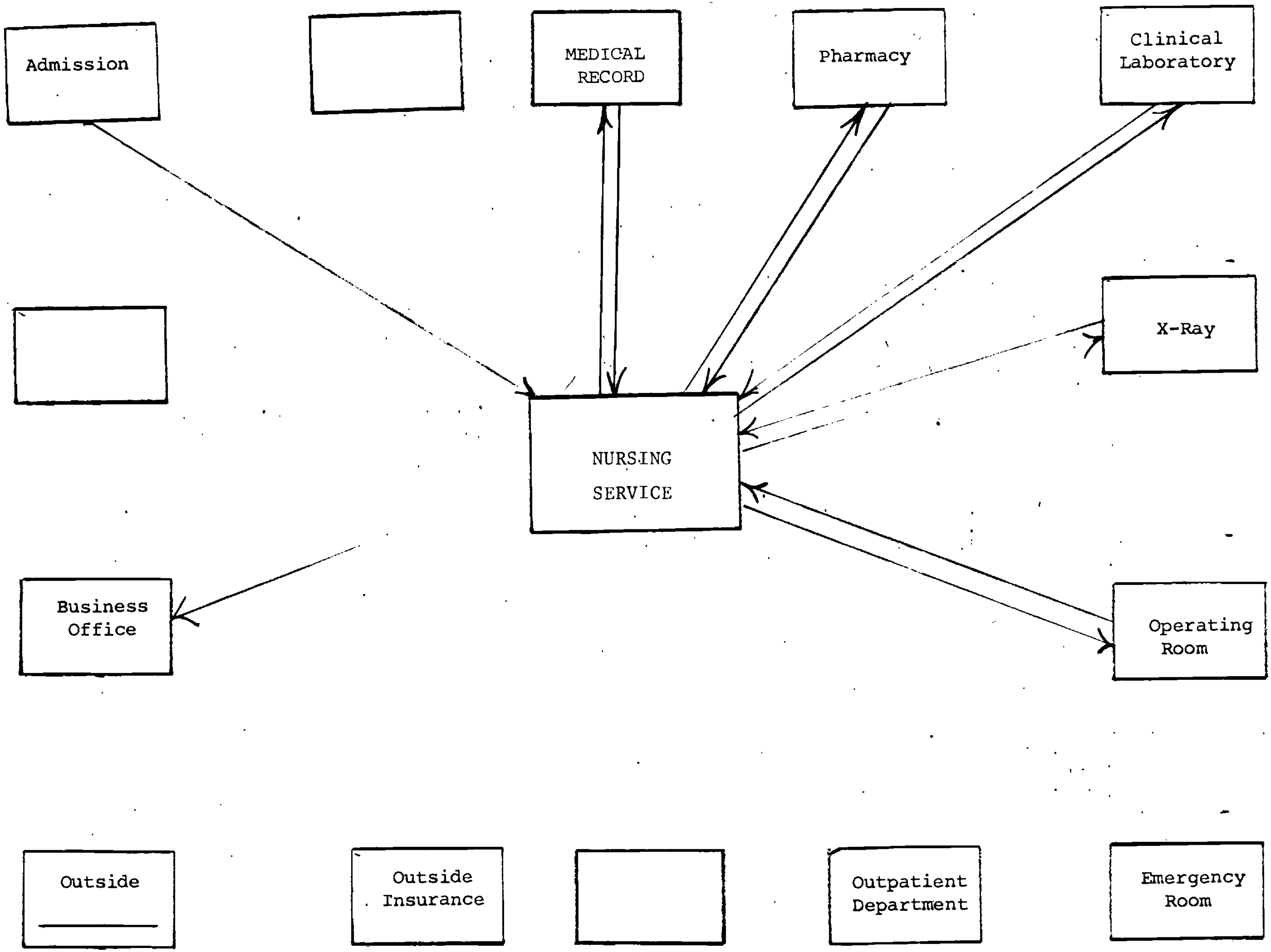
SECTION 3

BLOCK DIAGRAMS INDICATING ANTICIPATED DATA FLOWS

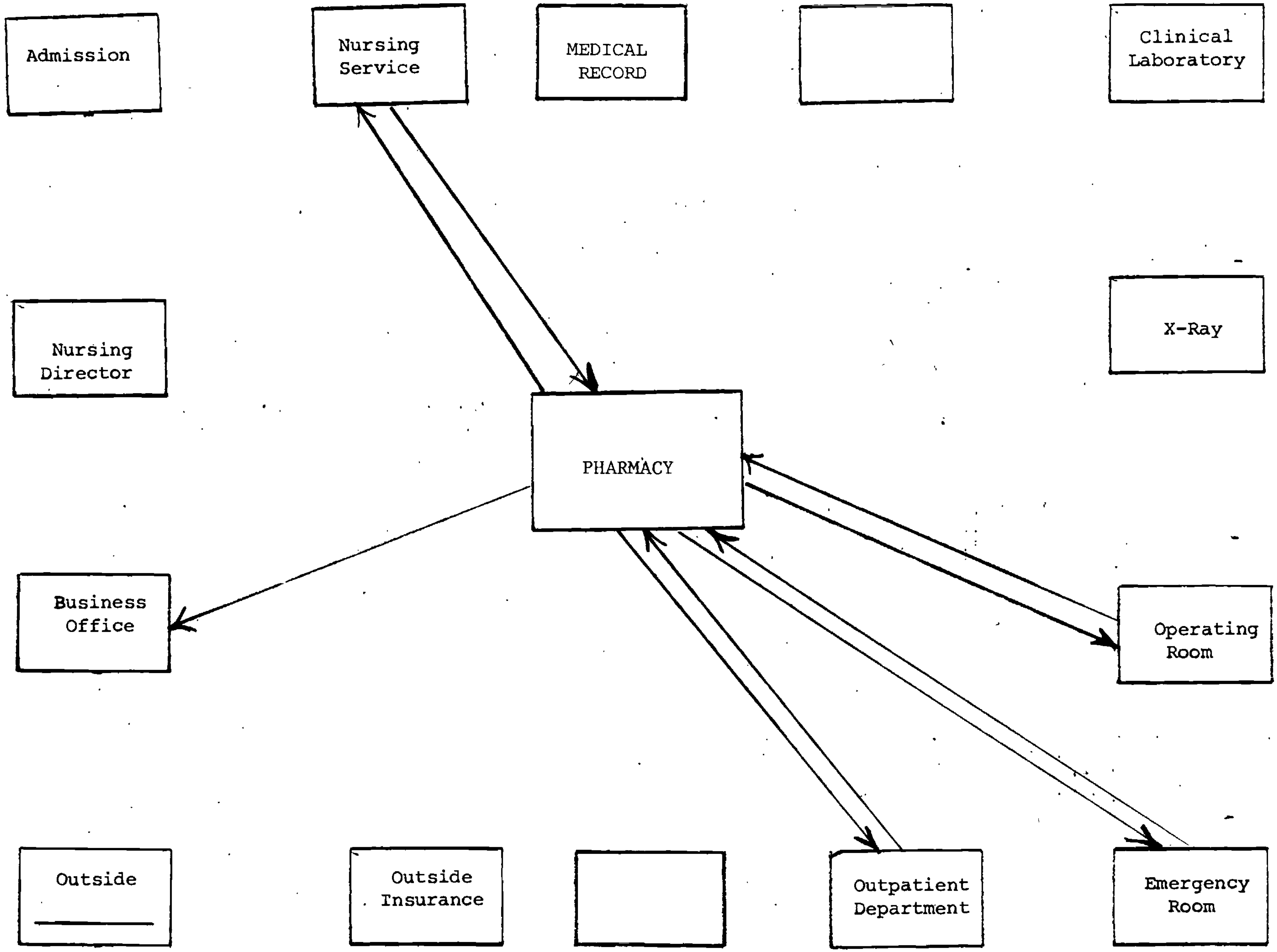

Admission
Nursing Service
Pharmacy
Clinical Laboratory
X-Ray
Nursing Director
MEDICAL RECORD DEPT
Business Office
Operating Room
Outside
Outside Insurance
Outpatient Department
Emergency Room

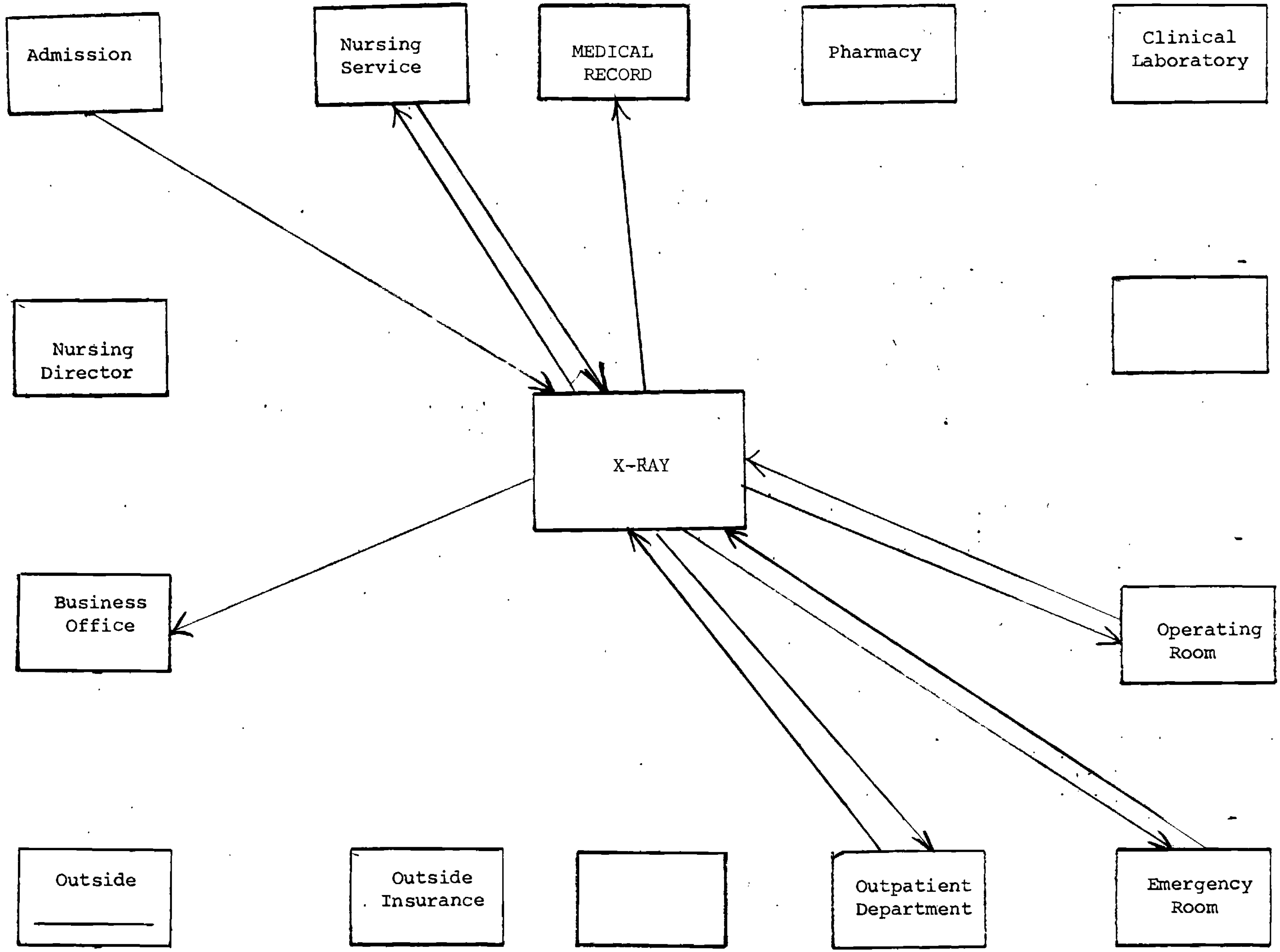
Hospital Number________________ Date______________ Interviewer______________



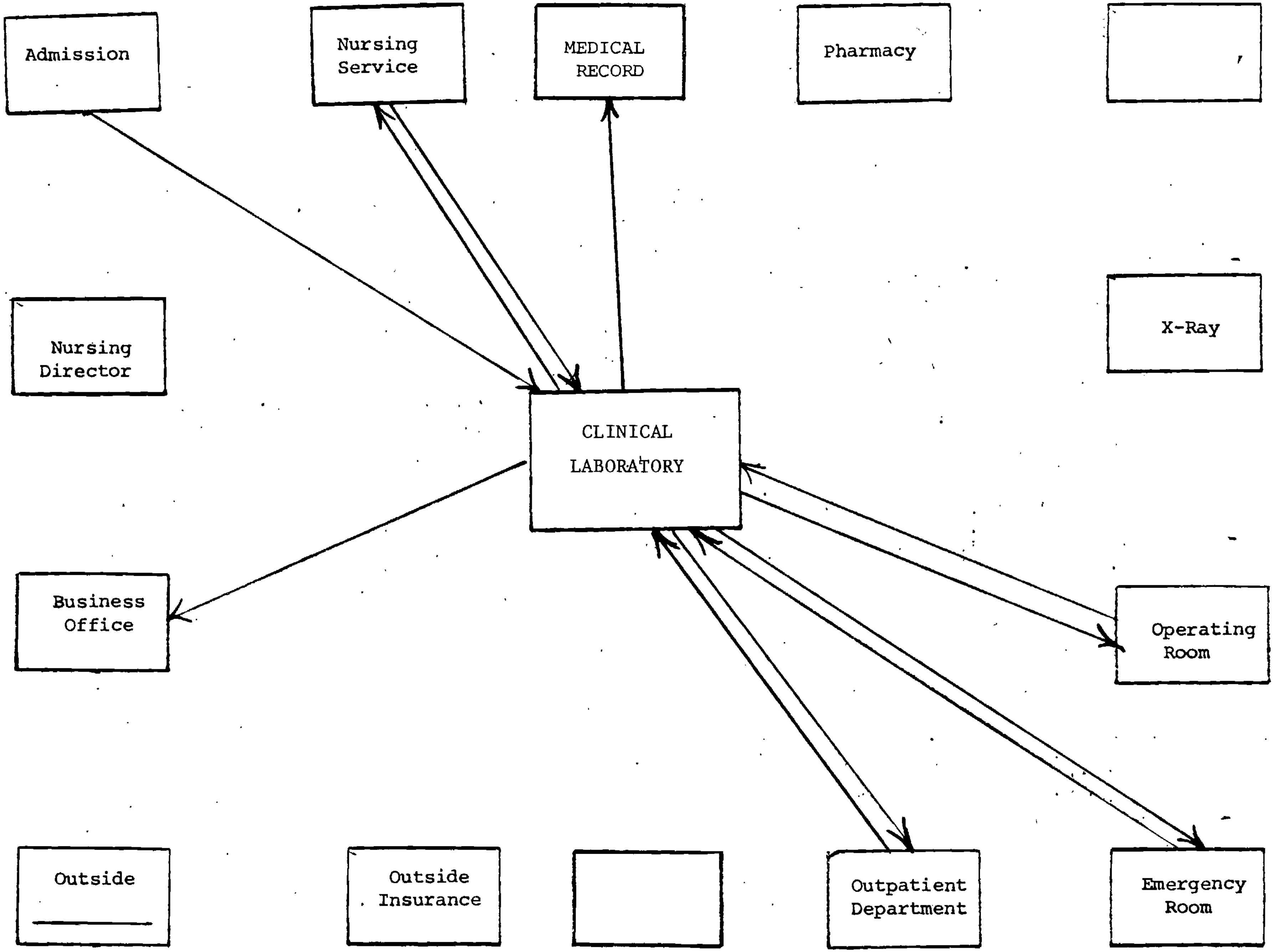

Admission
MEDICAL RECORD
Pharmacy
Clinical Laboratory
X-Ray
NURSING SERVICE
Business Office
Operating Room
Outside
Outside Insurance
Outpatient Department
Emergency Room

Hospital Number________________ Date______________ Interviewer______________

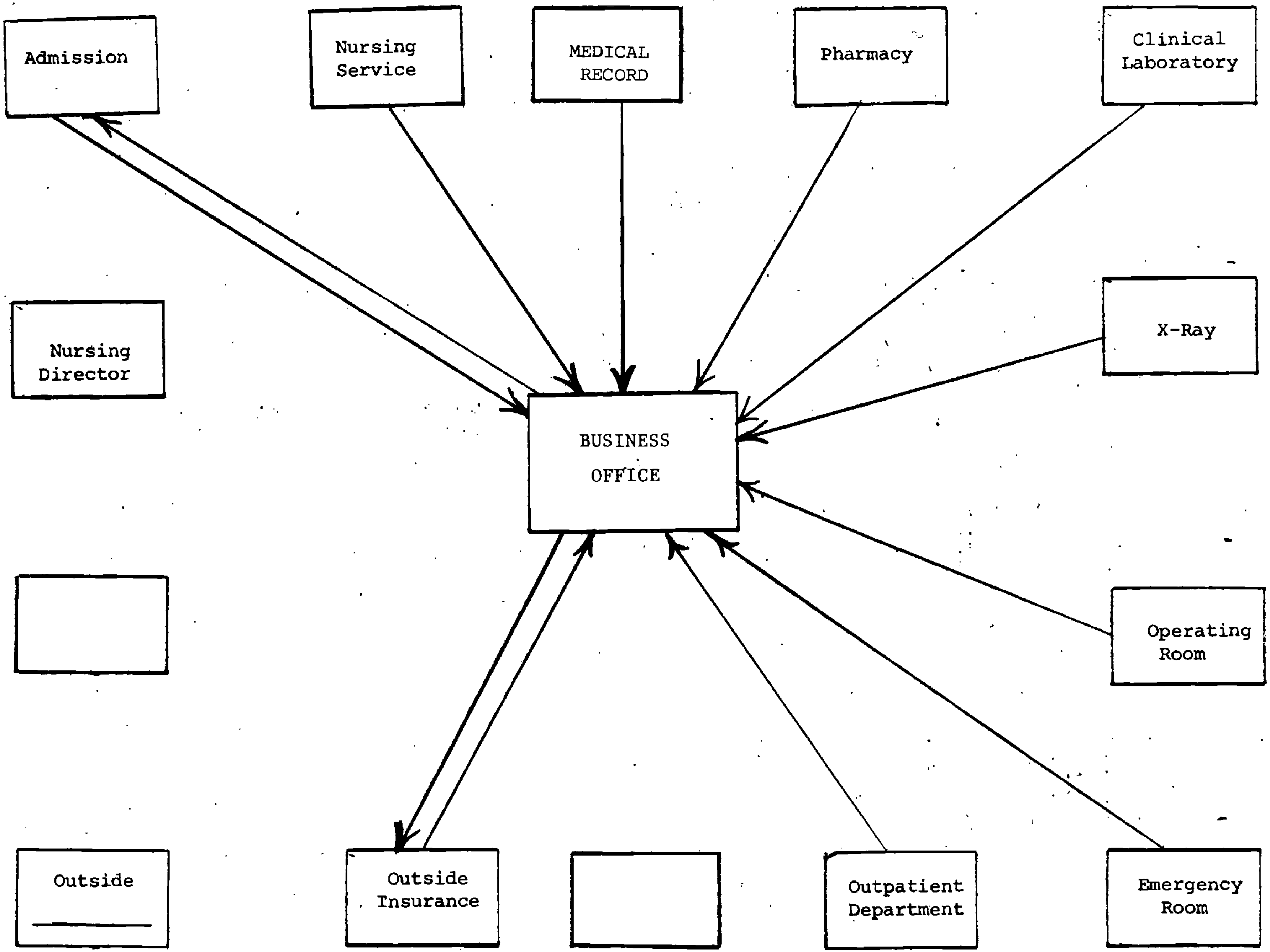



Admission
Nursing Service
MEDICAL RECORD
Pharmacy
Clinical Laboratory
Nursing Director
X-RAY
Business Office
Operating Room
Outside
Outside Insurance
Outpatient Department
Emergency Room

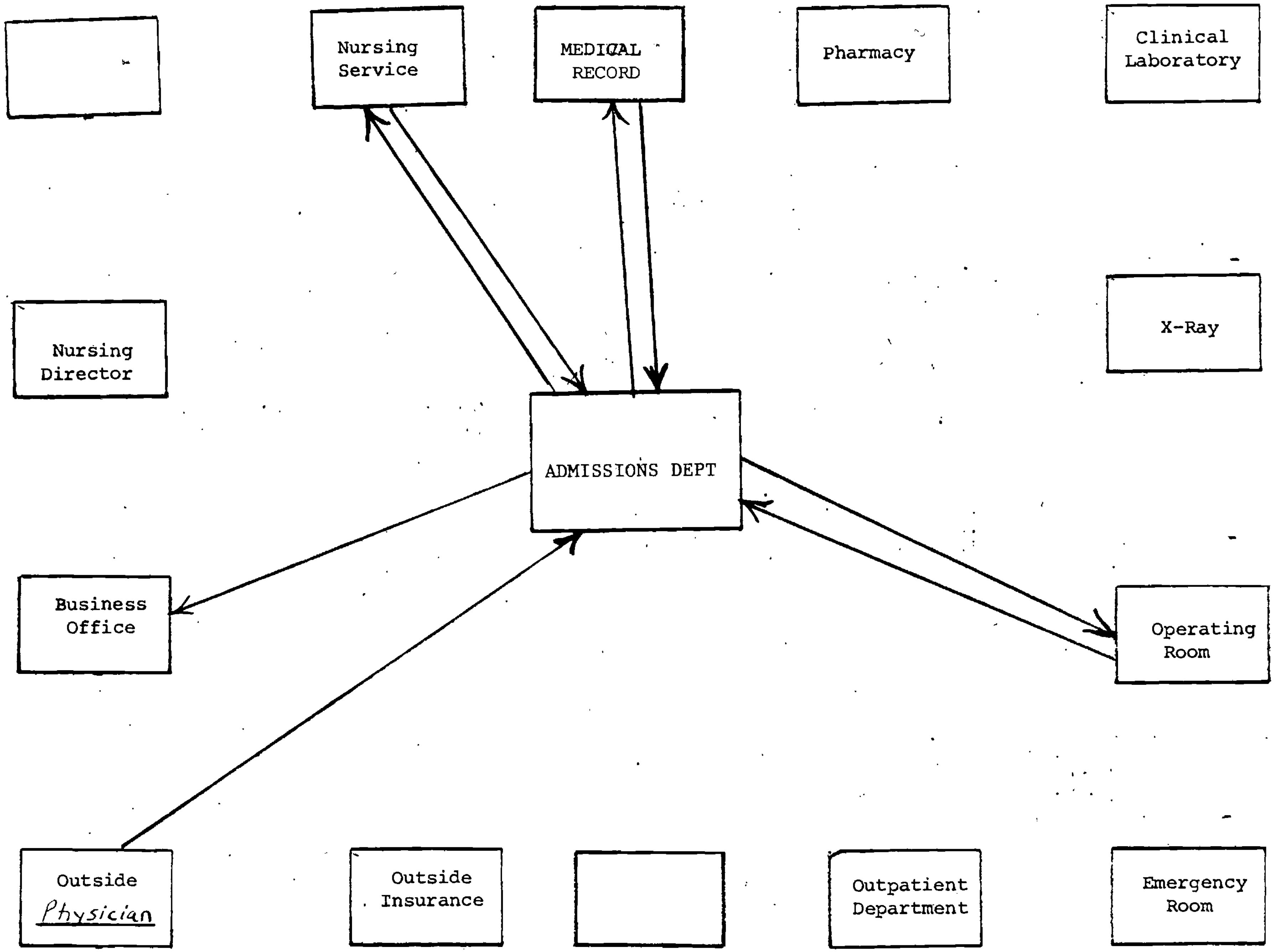
Hospital Number________ Date________ Interviewer________



Hospital Number__________ Date__________ Interviewer__________



Hospital Number________________ Date______________ Interviewer______________



SECTION 4

ANTICIPATED COMMUNICATION LINKS

ADMISSIONS OFFICE

Outputs

- Blue Cross Bill
- Medical Record
- Admission and Discharge Summary
- Admission Form
- Group Hospital Insurance
- Bill for Medicare Patients
- Request for Medical Record

Inputs

- Medical Record
- Request for Beds

BUSINESS OFFICE

Outputs

- Business Office File Jacket
- Blue Cross Bill
- Blue Cross Notification
- Medicare Approval Request
- Medicare Bill
- Group Insurance Bill

Inputs

- Blue Cross Bills
- Admission and Discharge Summary
- Group Hospital Insurance Form
- X-Ray Request
- Laboratory Request
- Pharmacy Request

NURSING SERVICE

Outputs	Inputs
Radium Therapy Request	X-Ray Results
Request for X-Ray	Laboratory Results
Request for Laboratory	Admission Slips
Pharmacy Request	Medical Record
Pharmacy Narcotic Request	Typed History and Physical
Medical Record	
Discharge Slip	
Request for Medical Record	
Daily Patient Condition and Census Report	

CLINICAL AND PATHOLOGY LABORATORY

Outputs

Laboratory Reports

Laboratory Billing Chits

Pathology Reports

Laboratory Results

Inputs

Laboratory Request

Request for Laboratory Information

RADIOLOGY DEPARTMENT

Outputs

X-Ray Results

X-Ray Therapy

X-Ray Billing Chits

X-Ray Information

Inputs

X-Ray Requests

Request for X-Ray Information

SECTION 5

SOME HINTS ON INTERVIEWING

An interview is generally conducted for one of the following reasons:

- Fact finding -- interviewing a person to learn something from him
- Informing -- telling the interviewee something
- Motivating -- influening the person's feelings or behavior
- Appraising -- assessing the interviewee's personality, education, and experience.

While the interview most often aims at all or several of these ends at the same time, one will predominate. Following are some helpful techniques for improving your interviewing.

1. Decide why you should conduct an interview
   - Make sure your problem is significant.
   - Use interviews discriminatingly.
   - Use interviews to gain access to objective data, to observe interviewees, and to determine opinions, attitudes, or beliefs.
   - Do not use the interview to compile data of uncertain value or to get generally available information.
2. Prepare thoroughly for each interview
   - Decide exactly what you want to accomplish. Define your objectives.
   - Prepare an interview outline in detail, with numbered topics, so interview notes can be readily tied to the corresponding topics in your outline.
   - Learn something in advance about the prospective interviewee -- his or her major duties, personality, characteristics, strengths, and weaknesses.
   - Make appointments. Try to schedule them several days or at least several hours ahead, both as a courtesy and as a means of conserving time.

- Provide for privacy. Consider using a private office where neither party will be disturbed or interrupted.
- Consider the interviewee's possible viewpoints, then examine and discount your own prejudices.

3. Observe the courtesies and mechanics of successful interviewing
   - Be prompt in keeping appointments. If it is necessary to change appointments, give the interviewee ample notice.
   - Respect the property in the office where the interview is conducted.
   - Relax, but do not sacrifice good business poise and dignity.
   - Reschedule the interview if unfavorable conditions exist. If the executive is under extreme immediate pressures, or if he is irritable or upset, it is better to arrange a later visit.
4. Obtain introductions to client personnel
   - Initial introduction to the top man you are to deal with in the client organization should ordinarily be made by your project leader.
   - Subsequent introductions to other client executives probably will be made by your initial client contact.
5. Conduct the interview effectively

Two basic types of interviewing are used: directive and non-directive. Directive interviewing employs the use of a direct question which seeks a direct answer. Example: "Do you smoke?" The answer will probably be "Yes" or "No." A non-directive question usually forces the interviewer to express himself more fully and therefore is often more revealing. Example: "What is your opinion of cigarette versus pipe smoking?" After such a question, you will learn if the interviewee does smoke as well as other revealing information; on some occasions, though, the interviewee may not reveal whether he or she smokes. Therefore, a combination of non-directive and directive interviewing is sometimes necessary.

The advantages and disadvantages of the directive and non-directive methods are listed below:

Directive

Advantages	Disadvantages
Gets direct answers	Conceals valuable information
Saves some interview time	Encourages impulsive decisions
Promotes vigorous interviews	Can cause irritations
Provides for faster appraisal	Reduces opportunity to be fully sensitive to the interviewee's inner feelings.

Non-Directive

Advantages	Disadvantages
Reveals more information	Encourages loquacity
Provides clearer understanding	Consumes more time
Allows for more accurate appraisal	Can be boring
Tends to relax interviewee	Requires more alertness and retentive powers.
Increases opportunity for better handling of people	
Offers more flexibility in interviewing	

The most successful interviews usually emphasize the non-directive technique but use the directive technique when desirable or necessary to achieve maximum results.

Additional points for effective interviewing include:

- Make a good first impression. Gain and deserve the interviewee's confidence.
- Put the interviewee at ease. Slant your approach, your vocabulary, your problem to meet him or her on comfortable grounds.
- Open with some pleasantries. Do not plunge into life histories and salary status.
- Start with a non-directive approach. Avoid any impression that you are conducting an inquisition or that the interviewee is a defendant on trial.

- Assure the interviewee that the information he gives will be held in confidence. For instance, you could say that the data that will appear in the final report will be drawn from many interviews and from operating, financial and statistical information and that your own ideas and evaluation of these various sources will be included.
- Try to be helpful until the interviewee is at ease. Remember, he probably will pass on to his associates a few comments on your general approach and handling of the interview.
- Be careful how you state questions. Ask questions at first which are unlikely to cause balking or evasion. Ask only one question at a time. Take pains to phrase your questions so they are easily understood. If you offer alternative questions phrase them so that either is acceptable to the interviewee. Avoid implying the answer to your own question.
- Be a good listener. Be alert to detect important side subjects which you can explore later. Careful attention will also convince the interviewee of your interest in his problems.
- Change your planned sequence of topical discussion if conditions warrant. For example, the interviewee might start talking immediately about "problems" when you had planned to talk about "objectives." Do not interrupt his chain of thought or cut him off. Listen awhile and then shift tactfully to subjects you want to cover.
- Keep important questions in mind until adequate information is obtained on each. Dismiss each question that is definitely answered so that you can concentrate on the next one. Follow and check your interview outline.
- Ask for specific examples or supporting evidence to substantiate important statements. Encourage his referral to reports and statistics. Ask for copies if you want to study them.
- Do not hesitate to ask an interviewee to explain any matter not clear to you, even though he has gone over it before. He will respect your desire to obtain accurate information and

impressions. Help the interviewee to realize his responsibility for the facts.

- Judge the effectiveness of your time. Terminate an interview if you have obtained all the information you can hope to get and if the conversation tends to drift to non-essentials. If the man appears to be reluctant to volunteer information and the time is being wasted, try diplomatically to terminate the discussion. Search for the basic reason for reluctance and discuss it with your project leader; if the problem can be overcome, try again later.
- Arrange additional time to cover the subject if the appointed time is not long enough. Adjust your pace to that of the interviewee. The more important the position that the he or she occupies, the more time will generally be required. Make up any lost time, if necessary, in lower-levels of the organization.
- Keep control of the interview. Don't permit the interviewee to run away with it. Tactfully make him aware of the purpose of the interview and the information which must be obtained in a limited time.
- Ideas, objectives and broad problems are usually discussed with executives; details are discussed with their subordinates.
- Take fewer notes during interviews with top executives than with their subordinates. Record carefully the high points of the interview immediately after leaving the executive's office. With personnel of any level don't bury your nose in your notes. If you scribble voluminous notes, the interview may be ruined.
- In closing the interview, it is usually effective to summarize the key points of the discussion. It shows the interviewee that you understand his remarks and his problems and gives him an opportunity to correct or supplement your impressions.
- Ask if there are any other matters which the executive thinks pertinent to the discussion. Thank him for his time and

interest. Leave the door open for initiation of further discussion by either party.

- Watch for any closing remarks by the interviewee that might have been withheld previously and that might now be made after the removal of the interview tension. This can happen quite often after you stop taking notes.

6. Observe these "Do's" and "Don'ts" of interviewing

<u>DON'TS</u>

Don't do all the talking.

Don't interrupt and block thought.

Don't be openly evaluative -- especially early in the interview.

Don't give advice too freely.(It is best to give no advice in personnel appraisal interviews. In other interviews, it is better to lead the interviewee to his own proper reasoning.)

Don't use the interview as a catch-all .

Don't start with over-all opinions.

Don't use "stereotypes" or be trapped by the halo effect.

<u>DO'S</u>

Do plan the interview.

Do precondition the interviewee.

Do have a proper setting.

Do develop rapport.

Do get the interviewee talking early.

Do allow enough time.

Do use pauses.(If he hesitates, stops short, or runs down without finishing -- wait. Interesting information may follow if you do not take him off the hook.)

Do listen -- actively.

Do get the full meaning of statements.

Do have interviewee qualify answers.

Do check answers against reliable criteria.

Do separate facts from inferences.

Do be objective.

Do make notes -- appropriately (when gathering facts -- not generally in personnel interview appraisals.)

Do note comments immediately after the interview.

Do remember the limitations of the interview.

Do analyze your interview techniques and performance after each interview.

7. Be a good listener

Good listening habits are tantamount to being an effective interviewer. Concentration, alertness, and sensitivity are required to interpret fully what is said by the interviewee. It is essential that the interviewer must listen: for the words, for the meaning behind the words, and for the feeling about what was said.

Bad listening habits which should be omitted include:

- Hop, skip and jump listening. This is "on and off" listening caused by diverting the mind to unrelated subjects suggested by the interviewer's statements.
- "I-Get-The-Facts" listening. Obtaining too many individual facts instead of the main ideas can create a reaction which is too general.
- Emotional deaf spots. If an interviewee refers to anything which causes strong emotional reactions within you, recognize the dangers and interview accordingly.
- Supersensitive listening (deep-seated opinions -- prejudice.) If you are inclined to react to prejudice, use caution in keeping your mind free to listen.
- Difficult explanations. Try to overcome difficult explanations by summarizing and acknowledging important points only.
- Premature dismissal of a subject as uninteresting. It is easy to get bored; therefore, be careful not to treat things lightly.
- Mentally criticizing a man's delivery, physical appearance, or other characteristics. Such criticism is dangerously distracting and can lead to missing important information.
- Pretending attention. Listening requires an expenditure of energy which usually shows. Therefore, be careful to

stay alert and interested in what an interviewee says.

- Yielding to distractions.
- Pencil and paper listening. It is difficult to write and listen at the same time; note taking can reduce listening effectiveness. Notes should only be taken when recording statistical information. In a personnel appraisal interview, notes should be taken with discretion.

SECTION 6

EXAMPLE OF COMPLETED DATA COLLECTION FORMS FOR COMMUNICATIONS NETWORK ANALYSIS

Department: Pharmacy Date: ______ Initials: ______ Hospital: ______

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Narcotic Request	NS	30	-			✓							✓			✓			
Pharmacy Request	NS	7650	.9			✓										✓			
Pharmacy Returns	NS	1350	.9			✓													
Pharmacy Charge Slips	Bus Ofc			7650	.02		✓						✓						
TOTALS																			

Department: X-Ray Date: ______ Initials: ______ Hospital: ______

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Transportation Method: Mail	Transportation Method: Pneum. Tube	Transportation Method: Dumbwaiter	Transportation Method: Telephone	Transportation Method: Teletype	Transportation Method: Other	Preparation Method: Handwritten	Preparation Method: Typed	Preparation Method: Computer	Preparation Method: Pre-record	Preparation Method: Other	No. Copies/Form	Remarks
X-Ray Request	NS	1710						✓					✓						
X-Ray Request	OR	15						✓					✓						
X-Ray Result	NS			1455	.2	✓								✓					
X-Ray Result	OPD/ER			1540	.1	✓								✓					
X-Ray Code File	OR			1	.01	✓										✓			
X-Ray Result	OR			15	.05	✓								✓					
X-Ray Request	Bus Ofc			2100	.01	✓							✓						
X-Ray Code File	NS			1	.01	✓										✓			
TOTALS																			

Department: Lab Date: Initials: Hospital:

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Lab Request	NS	12480	-					✓					✓					4	
Lab Request	OR	180						✓					✓					4	
Special Lab Report	MR			60	.5			✓					✓						
Lab Routine Report	MR			800	.5			✓					✓						
Lab Report	Bus Ofc			12660	.01						✓				✓			-	
TOTALS																			

Department: OR Date: Initials: Hospital:

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
X-Ray Code File	X-Ray	1	-			✓								✓				1	
X-Ray Report	X-Ray	15	12			✓								✓					
Lab Request	Lab			180	.1			✓					✓					3	
X-Ray Request	X-Ray			15	.1			✓					✓						
TOTALS																			

Department: OPD/ER Date: ______ Initials: ______ Hospital: ______

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Doc Operative Report	MR	500	–			✓										✓			
Med Rec	MR	500	–			✓										✓			
50 Day Letter	MR	120	–				✓									✓			
45 Day Letter	MR	150	–			✓										✓			
Adm & Sum Copy	Adm	900	–			✓										✓			
X-Ray Result	X-Ray	15210	–			✓									✓				
Doc Operative Report	MR			400	.08					✓							✓		
Medical Record	MR			500	.01	✓										✓		1	
" "																			

Department: Nursing Date:______ Initials:______ Hospital:______

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
X-Ray Code File Copy	X-Ray	30	-			✓								✓				1	
Medical Record	Adm	933	-			✓								✓				1	
X-Ray Result	X-Ray	1455	-			✓								✓					
Daily Accum Lab Rep	Bus Ofc	1125	-			✓									✓			1	
Dr Operation Rep	MR	400	-			✓								✓				1	
Narcotic Request	Pharm			30	.03	✓							✓					1	
Pharmacy Request	"			7650	.01	✓							✓					1	
Pharmacy Returns	"			1350	.01	✓							✓					1	
X-Ray Request	X-Ray			1710	.01		✓						✓					1	
Lab Request	Lab			12480	.1	✓							✓					4	
Medical Record	MR			873	.01	✓										✓		1	
TOTALS																			

Department: Admissions Date:________ Initials:______ Hospital:________

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Med Rec	MR	1200				✓										✓		1	
50 Day Letter	MR	120				✓										✓		1	
Med Rec	NS			933	.01	✓											✓	1	
Request for MR	MR			210	.03		✓											1	
Admission Notification	MR			900	.01	✓									✓				
Group Hospital Ins Form	Bus Ofc			750	.5	✓									✓				
Blue Cross Bill	Bus Ofc			900	.04	✓									✓				
Medicare Bill	Bus Ofc			300	.5	✓									✓				
Adm & Sum Copy	OPD			900	.01	✓										✓			
" " "	Other			900	.01	✓										✓			
" " "	Other			900	.01	✓										✓			
TOTALS																			

Department: Business Office Date: ________ Initials: ______ Hospital: ____________

Communication Link Name	Dept. Received from or Sent to	Input Links		Output Links		Transportation Method							Preparation Method					No. Copies/Form	Remarks
		Monthly Quantity	Queue Time	Monthly Quantity	Preparation Time	Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Handwritten	Typed	Computer	Pre-record	Other		
Adm & Sum Xerox Copy	MR	900	.1			✓										✓		2	
Medicare Bill	Adm	300	2.			✓								✓				6	
Group Hospital Insurance	Adm	750	-			✓								✓				1	
X-Ray Request Copy	X-Ray	2100	-			✓							✓					1	
Blue Cross Bill	Adm	900	.5			✓								✓				4	
Medical Record File Card	MR		-			✓										✓		1	
Lab Report Copy	Lab	12660	-			✓										✓		1	
Bus Ofc File Jacket	MR			800	.05		✓									✓		1	
Blue Cross Notification	Other			900	.04		✓							✓				2	
Medicare Bill	Other			300	.3		✓							✓					
Blue Cross Bill	Other			900	.5		✓							✓				1	
Group InsuranceBill	Other			1500	.25		✓							✓				1	
Medicare Approval Request	Other			300	.02		✓							✓				1	
Daily Accum Lab Rec	NS			1125	.33		✓									✓			
MR File Card	MR			900	.5		✓									✓			
Patient Disc Listing	MR			30	.5		✓									✓			
Final Accum Lab Report	MR			900	.3		✓									✓			
TOTALS																			

Department: Other (Outside World) Date: ______ Initials: ______ Hospital: ______

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Med Rec Copy	MR	200	-				✓								✓				
Discharge Coding Sheet	MR	960	-			✓							✓						
Record & Tissue Comm Form	MR	25	-			✓										✓			
Med Rec	MR	60	-			✓										✓			
Physicians Report	MR	1	-			✓								✓					
50 Day Letter	MR	120	-			✓									✓				
Blue Cross Notification	Bus Ofc	900	-				✓							✓					
Medicare Bill	Bus Ofc	300	-				✓							✓					
Blue Cross Bill	Bus Ofc	900	-				✓							✓					
Group Insurance Bill	Bus Ofc	1500	-				✓							✓					
Medicare Approval Request	Adm	300	-				✓							✓					
Adm & Sum Copy	MR	900	-			✓									✓				
Adm & Sum Copy	MR	900	-			✓									✓				
Med Rec Info Req	MR			200	.3		✓							✓					
TOTALS																			

Department: Medical Record Date:__________ Initials:______ Hospital:____________

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Med Rec File Card	Bus Ofc			900	.01			✓						✓				1	
Medical Rec	Other			60	.33	✓											✓	1	
"	Adm			1200	.1	✓											✓	1	
"	OPD			500	.1	✓											✓	1	
Physicians Report	Other			1	1.5	✓								✓				1	
50 Day Letter	Other			120		✓										✓			
50 Day Letter	OPD			120	.02		✓							✓					
45 Day Letter	OPD			150	.02	✓								✓					
50 Day Letter	Adm			120	.01	✓										✓			
TOTALS																			

Department: Medical Record Date:________ Initials:______ Hospital:__________

Communication Link Name	Dept. Received from or Sent to	Input Links: Monthly Quantity	Input Links: Queue Time	Output Links: Monthly Quantity	Output Links: Preparation Time	Transportation Method: Hand	Mail	Pneum. Tube	Dumbwaiter	Telephone	Teletype	Other	Preparation Method: Handwritten	Typed	Computer	Pre-record	Other	No. Copies/Form	Remarks
Business Ofc File Jacket	Bus Ofc	800				✓											✓	1	
Med Rec File Card	" "	900	48			✓									✓			1	
Patient Discharge Listing	" "	30	.01			✓									✓			1	
Final Accumulative Lab Rep	" "	900	.01			✓									✓			1	
Med Rec Request	Adm	210	3					✓										1	
Admission Notification	Adm	900	.04			✓												1	
Doc Operative Rep	OPD/ER	400	.08							✓							✓	1	
Medical Record	"	500	.12			✓											✓	1	
Medical Record	NS	873	.12			✓											✓	1	
Special Lab Report	Lab	60	.04					✓										1	
Routine Lab Report	Lab	800	.04			✓									✓			1	
Med Rec Info Request	Outside	200	.2				✓							✓				1	
Adm Sum Copy	Bus Ofc			900	.2	✓										✓			
Doc Operative Report	NS			400	.2	✓								✓				1	
" " "	OPD			400		✓										✓		1	
Med Rec Copy	Outside			200	.3		✓									✓		1	
Discharge Coding Sheet	Outside			460	.09	✓							✓					1	
Rec & Tis Committee Form	Other			25	.01	✓							✓					1	
TOTALS																			

APPENDIX B

Appendix to Chapter 3

APPENDIX B

SECTION 1

INDEPENDENT VARIABLE DEFINITIONS

APPENDIX B

SECTION 1

INDEPENDENT VARIABLE DEFINITIONS

A. Output Required

OR1 Enter 1 if details of the twelve operations are an output requirement; enter 0 if not required

OR2 Enter 1 if function differences between standard staff time existing staff are an output requirement

OR3 Enter 1 if summary of the Medicare records function is an output

B. Total Staffing

Total existing staff time: This is the total existing man-hours per week in medical records.

C. Operations Performed

Note: Enter 1 if operation is performed by the medical record function
Enter 0 if operation is NOT performed by the medical record function

FP1 Record Pickup
FP2 Record Assembly and Analysis
FP3 Transcription
FP4 Coding and Abstracting
FP5 Indexing
FP6 Numbering and filing of records
FP7 Retrieval and record location control
FP8 Preparing statistical reports and birth certificates
FP9 Incoming phone calls and outgoing calls for missing records
FP10 Correspondence and in-person information requests
FP11 Outpatient records
FP12 Emergency room records

D. Record Pickup

I1 Trips per day (all shifts): This is the average number of round trips per day (by all means of transportation) made by medical record personnel to pick up records of discharged patients. This number may be estimated.

I2 Pickups per trip: This is the average number of times medical record personnel pick up and sign for a stack of records on a trip. It can be estimated.

I3 Walked paces per trip in unobstructed Area: This is the distance of an average trip in paces. Only that part of the trip where there are no fixed obstruction (like desks or tables) should be measured. The remaining paces will be counted in the next workload statistic.

I4 Walked paces per trip in obstructed area: This is the number of paces on an average trip where fixed obstructions are encountered (Example: walking inside the medical record area).

I5 Unobstructed cart paces per trip: This is the average number of paces through an area without fixed obstructions that a cart is pushed. This distance of a typical trip should be measured.

I6 Obstructed cart paces per trip: This is the average number of paces through an area with fixed obstructions that a cart is pushed. This distance on a typical trip should be measured.

I7A Cart starts-stops per trip: This is the average number of stops made with a cart on a trip. Estimate the average number of stops, or count the stops on a typical trip.

I8 Elevator rides per trip: This is the number of times medical record personnel get on an elevator on a trip to pick up records. It should be estimated.

I9 Traffic floors per trip: This is the average number of times that an elevator stops to take on or let off passengers on a trip. It should be estimated.

I10 Elevator floors per trip: This is the average number of floors traveled in the elevator on a trip to pick up records. Count the destination floor as one floor. It can be estimated or counted for a typical trip.

I11 Floors per upward trip by stairway: This workload is the number of floors per trip that are traveled by walking up the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

I12 Floors per downward trip by stairway: This is the number of floors per trip that are traveled by walking down the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

I13 Dumbwaiter trips per day (all shifts): This is the average number of times per day that the dumbwaiter is used to transport records of discharged patients.

I14 Pneumatic tube loads per day (all shifts): This is the average number of times per day that medical record personnel load medical records in the pneumatic tube carrier. It can be estimated or counted for a typical day.

I15 Pneumatic tube unloads per day (all shifts): This is the same as number I14 above.

I16A Work days per week: This is the number of days per week that the record pickup section is staffed. Do not double count for multiple shifts.

I17A <u>Existing staff time per week</u>: This is the estimated man-hours per week (all shifts) spent on record pickup.

E. <u>Record Assembly and Analysis</u>

Obtain the yearly totals for discharges in each of the four categories listed below:

J1A <u>Total yearly newborns discharges</u>

J2A <u>Total yearly obstetrics discharges</u>

J3A <u>Total yearly medical discharges</u>

J4A <u>Total yearly surgical discharges</u>

J5A <u>Workdays per year</u>: This is the number of days per year that the record assembly and analysis section is staffed (1 shift per day).

J6 <u>Average number of setups per day</u> (all shifts): The setups per day workload is the average number of times per day that medical record clerks prepare to assemble or analyze a group of records. It can be estimated.

Take 30 records in each of the four categories of discharged patients listed below and count the total number of pages in each group of 30 records.

J7A <u>Total pages in 30 newborn records</u>

J8A <u>Total pages in 30 obstetric records</u>

J9A <u>Total pages in 30 medical patient records</u>

J10A <u>Total pages in 30 surgical records</u>

Read the descriptions of the 2 workloads listed next and decide if they are associated with your system of completing records left incomplete by nurses.

J11 <u>Notification calls per day</u> (all shifts): This workload is the number of calls per day made to the nursing station to tell them about the incomplete records so that the nurses can complete them. It can be estimated or counted for a typical day.

J12 Completion calls per day (all shifts): This workload is the number of calls per day to the nursing station to get the necessary information so the caller can complete the record himself. It can be estimated or the incomplete records (set aside for completion by phone) can be counted in a typical day.

J13A Total weekly incomplete records (all shifts): This workload is the average number of records left incomplete by nurses per day. It is involved in all systems for handling incomplete records. These records should be counted for a typical week.

J13B Workdays per week: This is the number of days per week that the record assembly and anaysis section is staffed.

J14 Trips per day (all shifts): This is the average number of trips per day by medical record personnel necessary to assemble and analyze records. It can be estimated.

J15 Pickups per trip: This is the average number of times medical record personnel pick up and sign for a stack of records on a trip during assembly and analysis. It can be estimated.

J16 Unobstructed paces per trip: This is the distance of an average trip in paces. Only that part of the trip where there are no fixed obstructions (like desks or tables) should be measured. The remaining paces will be counted in the next workload.

J17 Obstructed paces per trip: This is the number of paces on an average trip where fixed obstructions are encountered (Example: walking inside the medical record area).

J18 Unobstructed cart paces per trip: This is the average number of paces through an area without fixed obstructions that a cart is pushed on a trip. It should be measured for a typical trip.

J19 Obstructed cart paces per trip: This is the average number of paces through an area with fixed obstructions that a cart is pushed on a trip. It should be measured for a typical trip.

J20A Cart starts-stops per trip: This is the average number of stops made with a cart on a trip. Estimate the average number of stops or count the stops on a typical trip.

J21 Elevator rides per trip: This is the number of times medical record personnel get on and off an elevator on a trip during assembly and analysis. It should be estimated.

J22 Traffic floors per trip: This is the average number of times that the elevator stops to take on or let off passengers on a trip. It should be estimated.

J23 Floors per trip: This is the average number of floors traveled in the elevator on a trip. It can be estimated or counted for a typical trip.

J24 Floors per trip up: This workload is the number of floors per trip that are traveled by walking up the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

J25 Floors per trip down: This is the number of floors per trip that are traveled by walking down the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

J26 Dumbwaiter trips per day: This is the average number of times per day that the dumbwaiter is used to transport medical records.

J27 Loads per day: This is the average number of times per day that medical record personnel load medical records in the pneumatic tube carrier. It can be estimated or counted for a typical day.

J28 Unloads per day: This is the same as J27 except records are unloaded.

J29A If record processing is:

Separate (record is assembled and then passed to another clerk for quantitative analysis or set aside to await analysis) then J29A = 0

Combined (assembly and analysis is performed at the same time) then J29A = 1

(Note on J30A to J39B -- Enter 1 if applicable to your record handling system; enter 0 if not applicable to your record handling system.)

J30A No fastening - Simple handling
J31A Staple once
J32A Staple twice
J33A Punch record and clip with 2-prong clip
J34A Paper clip
J35A Call nursing station and inform them of deficiencies
J36A Call nursing station and get information necessary to complete record
J37A Write patient name and/or number and insert in folder
J38A Examine work done by nurses
J39A File deficient records in drawer file
J39B File deficient records in open-shelf file
J40A Workdays per week: Same as J13B.

J41A Existing staff time per week: This is the estimated man-hours per week (all shifts) spent on record assessment and analysis.

F. Transcription

K1A Week's total doctors with incomplete records: This workload is the number of doctors to whom incomplete records must be distributed. Determine the total number of doctors to whom records are distributed in a typical week.

K1B Workdays per week: This is the number of days per week that the transcription section is staffed.

K2A Month's total incomplete records: This is the number of incomplete records distributed to doctors for completion. Count these records for a typical month.

K2B Workdays per month: This number is the number of days per month that the transcription section is staffed.

K3 Doctors' request per day (all shifts): This workload is the average number of requests per day concerning the completion of the medical record. It should be estimated.

K4A Total monthly counted records: This workload is the total number of incomplete records per day in doctors' files or boxes which must be counted to determine if a certain limit has been exceeded. Count the number of daily incomplete records for one typical month.

K4B Workdays per month: Same as K2B.

K5 Words per doctor in delinquent record report: This workload is the number of words for each doctor in a report and/or notice concerning delinquent records. Count the words pertaining to one doctor in your notices and/or reports.

K6A Month's total delinquent reports per doctor: This workload is the number of doctors per day whose incomplete records when counted exceed a prescribed limit (that is, doctors for whom special notices and/or reports must be written). Count the number of doctors reported and/or notified in a typical month.

K6B Workdays per month: Same as K2B

K7A Month's belts or discs: This is the number of belts or discs with doctors' dictation that have to be transcribed in one typical month.

K7B Workdays per month: Same as K2B.

K8IA Month's total reports: This is the number of reports transcribed during a typical month.

K8IB Workdays per month: Same as K2B.

K9IA Total pages in 30 reports: This workload is the total number of pages in 30 reports.

K10IA Month's total operation diagnoses: This workload is the number of operation diagnoses typed in a typical month.

K10IB Workdays per month: Same as K2B.

K11IA Full lines on 30 pages: This workload is the number of full lines (6-1/2 inches or more) per page of a transcribed report. Count the number of full lines in 30 pages.

K12IA Partial lines in 30 pages: This workload is the number of partial lines (less than 6-1/2 inches) per page of a transcribed report. Count the number of partial lines on 30 pages.

K8IIA Month's total transcribed reports: This workload is the number of reports to be transcribed in a typical month.

K8IIB Workdays per month: Same as K2B.

K13IIA Month's total batches: This is the number of batches of belts or discs sent out for transcription in a typical month.

K13IIB Workdays per month patients: Same as K2B.

K14A Year's total newborn patients: Same as J1A.

K14B Workdays per year: Same as J5A.

K15A Year's total obstetrics patients: Same as J2A.

K16A Year's total medical patients: Same as J3A.

K17A Year's total surgical patients: Same as J4A.

K18 Trips per day (all shifts): This is the average number of trips per day by medical record personnel in order to carry out transcription activities. It can be estimated.

K19 Pickups per trip: This is the average number of times medical record personnel pick up and sign for a stack of records on a trip.

K20 Unobstructed paces per trip: This is the number of paces on an average trip. Only that part of the trip where there are no fixed obstructions (like desks or tables) should be measured. The remaining paces will be counted in the next workload.

K21 Obstructed paces per trip: This is the number of paces on a trip where fixed obstructions are encountered (Example: walking inside the medical record area).

K22 Unobstructed cart paces per trip: This is the average number of paces through an area without fixed obstructions that a cart is pushed during transcription activities. The distance of a typical trip should be measured.

K23 Obstructed cart paces per trip: This is the average number of paces through an area with fixed obstructions that a cart is pushed during transcription activities. The distance of a typical trip should be measured.

K24A Cart starts-stops per trip: This is the average number of stops made with a cart on a trip. Estimate the average number of stops or count the stops on a typical trip.

K25 Elevator rides per trip: This is the number of times medical record personnel get on and off an elevator on a trip. It should be estimated.

K26 Traffic floors per trip: This is the average number of times that the elevator stops to take on or let off passengers on a trip. It should be estimated.

K27 Floors per trip: This is the average number of floors traveled in the elevator on a trip. It can be estimated or counted for a typical trip.

K28 Floors per trip up: This workload is the number of floors per trip that are traveled by walking up the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

K29 Floors per trip down: This is the number of floors per trip that are traveled by walking down the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

K30 Dumbwaiter trips per day (all shifts): This is the average number of times per day that the dumbwaiter is used to transport records or belts or other things in association with transcription activities. It can be estimated.

K31 Loads per day (all shifts): This is the average number of times per day that medical record personnel load medical records in the pneumatic tube carrier. It can be estimated or counted for a typical day.

K32 Unloads per day (all shifts): This is the average number of times per day that medical record personnel unload medical records in the pneumatic tube carrier. It can be estimated or counted for a typical day.

K33A Enter 0 if transcription is done by the Medical Record Department. Enter 1 if transcription is not done by the Medical Record Department.

K34A Enter 0 if incomplete medical records are put in order by doctor.
Enter 1 if incomplete medical records are not put in order by doctor.

K35A Enter 1 if placing incomplete medical record in doctor's box or pigeon hole is applicable.

K35B Enter 1 if placing incomplete medical record in doctor's drawer file is applicable.

K35C Enter 1 if placing incomplete medical record in doctor's open shelf file is applicable.

K36A Enter 0 if incomplete record notices and reports are handwritten.

K37A Enter 1 if incomplete record notices and reports are typed.

K37B Enter 1 if incomplete record notices are distributed to doctor's box or pigeon hole.

K37C Enter 1 if, for the incomplete record notice distribution, the name and department of doctor is typed.

K37D Enter 1 if, for the incomplete record notice distribution to doctors, an addressing card/envelope with addressograph is used.

K37E Enter 1 if inserting incomplete record notice in envelope, sealing and mailing it is applicable.

K38A Enter 0 if transcription belts are used.
Enter 1 if transcription discs are used.

K39A Enter 0 if transcription is done by the Medical Record Department.
Enter 1 if transcription is done outside the Medical Record Department.

K40A Enter 1 if drawer file is used for filing typed reports.

K40B Enter 1 if open shelf file is used for filing typed reports.

K40C Enter 1 if filing typed reports in patients' charts is applicable.

K40D Enter 1 if filing typed reports in doctors' box/pigeon hole is applicable.

K41A Decrease in workload-reports transcribed/day (K8IA ÷ K8IB): Count the number of transcribed reports per day that are not filed in either patient's chart or doctor's box/pigeon hole.

K42A Workdays per week: Same as K1B.

K43A Existing staff time per week: This is the estimated staff man-hours spent by the transcription section per week.

G. Coding and Abstracting

L1 Coding setups per day:
This is the number of times an operator begins coding per day. It involves preparing the work place, gathering necessary materials, etc. It should be estimated by someone familiar with this operation.

L2A Total yearly newborns: Same as J1A.

L2B Workdays per year: Same as J5A.

L3A Total yearly obstetrics: Same as J2A.

L4A Total yearly medical: Same as J3A.

L5A Total yearly surgical: Same as J4A.

L7 Abstracting setups per day: This is the average number of times per day that an operator prepares to abstract. It involves preparing the work place, gathering necessary materials, etc. It should be estimated.

L8A Total monthly PAS batches: This workload is the number of times per month that a batch of PAS forms is sent out to a data processing facility.

L8B Workdays per month: This is the number of days per month that the coding and abstraction section is staffed.

L9A Total items on 30 forms: This workload is the average number of items entered on abstract forms per day. Determine the number of items or entries on your abstract form. Count the total items on 30 forms.

L10A Total yearly statistical batches: The total number of batches of statistical reports should be counted or determined from existing records.

L10B Workdays per year: Same as J5A.

L11A Enter 1 if ICDA coding is done separately from abstracting.

L11B Enter 1 if ICDA coding and PAS abstracting is done together as one activity.

L11C Enter 1 if SNDO coding is done separately from abstracting.

L12A Enter 1 if ICDA coding is checked by medical record personnel.

L12B Enter 1 if SNDO coding is checked by medical record personnel.

L13A Enter 1 if abstracting is done on PAS form.
Enter 0 if abstracting is done on other forms.

L14A Enter 1 if items on abstract form are handwritten.

L15A Workdays per week: This is the number of days per week that the coding and abstracting section is staffed.

L16A Existing staff time per week: This is the number of hours spent by the existing staff on coding and abstracting per week (all shifts).

H. Indexing

M1 Indexing setups per day: This workload is the average number of times per day that operators begin or prepare to work on the master patient index. It should be estimated.

M2A Total new admissions: This workload is the number of new admissions. Take total for a year.

M2B Workdays per year: Same as J5A.

M3 Items per card: This workload is the average number of items on an index card that must be added to the card to indicate that the patient has been newly admitted. The average number can be figured on a monthly basis or estimated.

M4A Total yearly admissions or discharges: This workload is the number of admissions or discharges. Take the total admissions or discharges for a year.

M4B Workdays per year: Same as M2B.

M5 Updated items per card: This is the average number of items on an index card that have to be updated (changed or added to the card) to indicate that the patient has been readmitted or discharged. If the same items are always updated, they can be counted on one card. If the number of items varies, the average number should be estimated.

M6A Total yearly readmissions and discharges: This is the total number of readmissions plus corresponding discharges for one year.

M6B Workdays per year: Same as M2B.

Workloads for Maintaining Secondary Indices

Note: A secondary index is any card file other than the master patient index on which some information from the medical record is copied.

If you maintain more than one secondary index (for example, a diseases' index and a doctors' index), be sure to consider all of the secondary indices in determining the following workloads.

M7 Secondary index set-ups per day: This is the number of times per day that operators prepare to work on secondary indices. It should be estimated.

M8IA Year's total discharges: If all records are indexed, take the yearly discharge total.

M8IB Workdays per year: Same as M2B.

M8IIA Month's total indexed records: If only certain records are indexed, count the total number indexed in a typical month.

M8IIB Workdays per month: Same as M12B.

Note: This is the number of items that have to be copied on a secondary index card (i.e., disease, operation, and physician index card). Count the number of items on 30 cards.

M9A Items on 30 disease cards

M10A Items on 30 operation cards

M11A Items on 30 physician cards

Note: This is the average number of secondary cards indexed (i.e., disease, operation, and physician index cards). Count the cards made or updated in a typical month.

M12A Disease index cards per month

M12B <u>Workdays per month</u>: This is the number of days per month spent on indexing.

M13A <u>Operation index cards per month</u>

M13B <u>Workdays per month</u>: Same as M12B.

M14A <u>Physician index cards per month</u>

M14B <u>Workdays per month</u>: Same as M12B.

M15A Enter 1 if new admissions filing cards are arranged in alphabetical order.

M15B Enter 1 if alphabetical filing in drawer file is used for filing new admissions.

M15C Enter 1 if alphabetical filing in mechanical file is used for filing new admissions.

M15D Enter 1 if phonetic filing in drawer file is used for filing new admissions.

M15E Enter 1 if phonetic filing in mechanical file is used for filing new admissions.

M16A Enter 1 if alphabetical filing is in drawer file for master patient index file.

M16B Enter 1 if alphabetical filing is in mechanical file for master patient index file.

M16C Enter 1 if phonetic filing is in drawer file for master patient index file.

M16D Enter 1 if phonetic filing is in mechanical file for master patient index file.

M17A Same as M16A

M17B Same as M16B

M17C Same as M16C

M17D Same as M16D

M18A Enter 1 if you have secondary indices (other than master patient index).

M19A Enter 1 if you handwrite secondary index cards.

M20A Workdays per week: This is the number of days per week that the indexing section is staffed.

M21A Existing staff time per week: This is the estimated staff man-hours per week spent on indexing.

I. Filing

N1 Filing setups per day: The filing setups per day is the number of times per day that operators begin to file records. It involves cleaning the work place and stacking records. The number should be estimated.

N2A Year's total new admissions: Count the total number of new admissions in a year.

N2B Workdays per year: Same as J5A.

N3A Records filed per month: Count the total number of records filed in a typical month.

N3B Discharge/typical month: Obtain the total number of discharges for the same month as when the N3A workload was obtained.

N3C Total discharges per year: Obtain the total number of discharges per year.

N3D Filing workdays/year: Same as N2B.

N4A Readmissions per year: Count the total number of readmissions. per year.

N4B Workdays per year: Same as N2B.

N5 Items per new admissions folder: This workload is the number of items entered upon a new admissions folder during the preparation of the folder for filing. It can be estimated.

N6 Items per admission summary for readmitted patients: This workload is the number of items entered upon the admission summary for readmitted patients.

N7A Enter 1 if patient identification is handwritten on record folder of new admissions.

N7B Enter 1 if patient identification is typed on record folder of new admissions.

N7C Enter 1 if patient identification is stamped on record folder of new admissions.

N8A Enter 1 if record is inserted into folder with no fastening.
Enter 0 if record is inserted into folder and fastened with a clip.

N9A Enter 1 if records are serial ordered for filing.
Enter 0 if records are terminal ordered for filing.

N10A Enter 1 if filing is serial ordered in open shelf file.

N10B Enter 1 if filing is serial ordered in drawer shelf file.

N10C Enter 1 if filing is terminal digit ordered in open shelf file.

N10D Enter 1 if filing is terminal digit ordered in drawer file.

N10E Enter 1 if filing is mechanical.

N11A Enter value for man minutes/record for filing with mechanical equipment.

N12A Enter 1 if medical record assigns new number to a patient on readmission.
Enter 0 if patient keeps old number.

N13A Enter 1 if old record is retrieved from drawer file for readmission.

N13B Enter 1 if old record is retrieved from open shelf file for readmission.

N13C Enter 1 if old record is retrieved from mechanical file for readmission.

N14A Same as N11A.

N15A Enter 1 if readmission is on old folder.
Enter 0 if readmission is on new folder.

N16A Enter 1 if readmission is handwritten.
Enter 0 if readmission is typed.

N17A Enter 1 if readmission is handwritten.
Enter 0 if readmission is typed.

N18A Same as N13A.

N18B Same as N13B.

N18C Same as N13C.

N19A Enter 1 if summary is handwritten.
Enter 0 if typed.

N20A Workdays per week: This is the number of days per week that the filing section is staffed.

N21A Existing staff time per week: This is the estimated staff man-hours per week spent on filing.

J. Retrieval

Retrievals per day:

The retrievals per day is the number of times per day a medical record is called out of the file. Whenever this happens, some written indication that the record is not in the file is made. By counting these indicators for a typical month, a figure equal to the retrievals per month can be obtained. Choose system 1 or 2 for indicating those records that are not in the file, and count the indicators you use for a typical month.

SYSTEM 1: Using the cards, slips or outguides to indicate the record has been called out of the file.

For this system you should write or stamp counting numbers on the unused supply of blank cards, slips, or outguides at the beginning of a typical month. As you use these indicators, the number on the next blank indicator will be more than the records retrieved. At the end of the month, copy this number and subtract one. This will equal the records retrieved per month.

SYSTEM 2: Using registers or logs.

For this system you should draw a line in the register or log at the beginning of a typical month and then count all the entries after that line to the end of the month. Count only the new entries for records taken out and not the entries for records returned or for the movement of a record once it has been called out. This count will equal the records retrieved per month.

01A Records retrieved in a typical month: See above.

01B Workdays in a typical month: This is the number of days per month that the retrieval section is staffed per month.

02A Total number of transfers: The transfers per day is the number of times per day the location of records (called-out and retrieved) changes. Some written indication of the new location is made whenever this happens. By counting these indicators of new locations, a figure equal to the number of transfers can be obtained. Count the total number of changes of location indicated on cards, slips, or in a log for 30 medical records called out and retrieved.

03 Outguides removed per day: This is the average number of outguides removed per day after the receipt of records. (It can be estimated using a weekly basis if necessary for greater accuracy.)

04A Enter 1 if record filing is serial ordered in drawer file.

04B Enter 1 if record filing is serial ordered in open shelf file.

04C Enter 1 if record filing is serial ordered in mechanical file.

04D Enter 1 if record filing is terminal digit ordered in drawer file.

04E Enter 1 if filing is terminal digit ordered in open shelf file.

05A Enter value for man minutes/record for filing with mechanical equipment.

06A Enter 1 if outguides are handwritten.
Enter 0 if outguides are typed.

07A Enter 1 if, when maintaining control card file, the card is clipped to the record retrieved and set aside.

07B Enter 1 if clip is removed, and card and record are separated.

07C Enter 1 if control card or log entry is handwritten.

07D Enter 1 if called out cards are arranged alphabetically or numerically.

07E Enter 1 if control cards are filed.

07F Enter 1 if control cards are updated.

07G Enter 1 if located entries are crossed off (log or register) or if cards are removed from call out file (control cards).

08A <u>Workdays per week</u>: This is the number of days per week that the retrieval section is staffed.

09A <u>Existing staff time per week</u>: This is the estimated staff man-hours per week spent on retrieval.

K. Statistical

P1 Statistical report set-ups per day: The statistical report set-ups per day is the number of times per day that operators begin to prepare a report for doctors or other personnel based on medical records. It should be estimated.

P2A Total monthly report forms: Count the total number of statistical report forms prepared by medical record personnel in a typical month.

P2B Workdays per month: This is the number of days per month that the statistical section is staffed.

P3A Average number of copied items per report: Count the number of data items copied from medical records for 50 reports. Divide this total number of items by 50 to obtain average items per report.

P4A Total monthly records reported: Count the total number of records used in making statistical reports in a typical month.

P4B Workdays per month: Same as P2B.

P5A Total yearly newborns: Obtain the total number of discharged newborns for a year. Same as J1A.

P5B Workdays per year: Same as J5A.

P7 Trips per day: This is the average number of trips per day by medical record personnel in order to prepare reports or certificates. It can be estimated.

P8 Unobstructed paces per trip: This is the distance of an average trip in paces. Only that part of the trip where there are no fixed obstructions (like desks or tables) should be measured. The remaining paces will be counted in the next workload.

P9 Obstructed paces per trip: This is the number of paces on an average trip where fixed obstructions are encountered (Example: walking inside the medical record area).

P11 Elevator rides per trip: This is the number of times medical record personnel get on and off an elevator on a trip necessary to prepare reports or certificates. It should be estimated.

P12 Traffic floors per trip: This is the average number of times that the elevator stops to take on or let off passengers on a trip. It should be estimated.

P13 Floors per trip: This workload is the number of floors traveled in the elevator on a trip. It can be estimated or counted for a typical trip.

P14 Floors per trip up: This workload is the number of floors per trip that are traveled by walking up the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

P15 Floors per trip down: This is the number of floors per trip that are traveled by walking down the stairway. If this trip is of standard length and over the same route, it can be counted. Otherwise, the average number of floors should be estimated.

P16 Dumbwaiter trips per day: This is the average number of times per day that the dumbwaiter is used for transportation in preparing reports or certificates.

P17 Loads per day: This is the average number of times per day that medical record personnel load medical records in the pneumatic tube carrier. It can be estimated or counted for a typical day.

P18 <u>Unloads per day</u>: This is the same as P17, except records are unloaded.

P19A Enter 1 if data copied from record onto a report form is handwritten. Enter 0 if data copied from record onto a report form is typed.

P20A Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Prepare list of newborns.

P20B Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Interview mother.

P20C Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Interview mother - baby's name.

P20D Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Obtain mother's signature.

P20E Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Type birth certificates.

P20F Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Type address

P20G Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Assemble and insert certificate.

P20H Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Alphabetize for filing.

P20I Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
File in doctors' boxes.

P20J Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
File in mother's medical record.

P20K Enter 1 if the following is performed by Medical Record Department during birth certificate preparation.
Arrange worksheets.

P21A Workdays per week: This is the number of days per week that the statistical section is staffed.

P22A Existing staff time per week: This is the estimated staff man-hours per week spent on statistical activities.

L. Phone

Q1 Calls to staff per day: This workload is the number of calls per day that are referred to staff members. This can be counted in a typical day or estimated by someone familiar with this activity.

Q2 Unrecorded calls per day: This workload is the number of calls per day of which no record is made. This can be counted for a typical day or estimated by someone familiar with this activity.

Q3 Recorded calls per day: This workload is the number of calls per day during which a written message must be taken. These written notes can be saved for a typical day and counted.

Q4 Reference calls per day: This workload is the number of calls per day for which the person answering the phone must ask a question of the supervisor in order to supply the information requested by the caller. This can be estimated.

Q5 Returned calls per day: This workload is the number of calls per day for which a return call must be made to supply the necessary information. All of these calls will probably be "recorded" calls, that is, the first call will be noted down. If a notification is made for each incoming call of this type that a return call will be necessary, these notifications can be counted for a typical day and the count will be equal to the returned calls per day.

Q6 Calls to doctors per day: This workload is the number of calls per day made to doctors who have out delinquent records. Since a count which is taken to determine which doctors have delinquent records is a standard medical record activity, the number of doctors that have to be contacted can be noted at that time.

Q7 Calls to nurses per day: This workload is the number of calls per day that are made to the nursing station to request the return of a medical record or a report#. If some notification exists that shows that a missing medical record or report is at the nursing station, these notes can be counted for a typical day to indicate the number of these calls that will have to be made. Otherwise, this may be estimated.

#Note: This is not to be confused with calls concerning incomplete records which have been returned. Completion calls were already accounted for in Record Assembly and Analysis.

Q8A Workdays per week: This is the number of days per week that the phone section is staffed.

Q9A Existing staff time per week: This is the estimated staff man-hours per week spent on phone.

M. Correspondence

R1 Correspondence setups per day: This is the number of times per day that operators prepare to handle correspondence. It involves obtaining stationary and supplies and cleaning a work place. It should be estimated by someone familiar with the way correspondence is handled.

R2A Total monthly request letters: This is the total number of letters received requesting information during a typical month.

R2B Workdays per month: This is the number of days per month that the correspondence section is staffed.

R3 Items per request: This is the number of items which must be written or typed onto the card, slip, or abstract which accompanies the request form.

R4A Total monthly deficient requests: This is the total number of letters received requesting information that is not sufficiently authorized during a typical month. For example, the patient's signature, which may be required by your department, may be missing. You should save all letters for a month to determine R2A (above) and then separate and count the letters that are not authorized.

R4B Workdays per month: Same as R2B.

R5 Words per authorization: This workload refers to the length of a letter which would normally be sent to anyone requesting medical record information without sufficient authorization. Count the words in a typical letter of this type.

Note: If your department has a form letter which is sent in cases where a request is not sufficiently authorized to obtain from the party requesting information the patient's signature or whatever else is required, you should not determine this workload.

R6A Total pages copied for 30 reports: This is the average number of pages of the medical record that have to be copied to comply with a request for information. Count the number of pages copied in answering 30 requests.

R7A Total weekly in-person requests: This can be determined by counting the number of such requests that are made in a typical week.

R7B Workdays in a typical week: This is the number of days per week that the correspondence section is staffed.

R8A Enter 1 if request for medical record information is copied for reference by hand.
Enter 0 if request for medical record information is copied for reference by typing.

R9A Enter 1 if additional authorization is requested by form letter.
Enter 0 if additional authorization is requested by other means.

R10A Enter 1 if request for additional authorization is handwritten.
Enter 0 if request for additional authorization is typed.

R11A Enter 1 if records are filed by serial.

R11B Enter 1 if records are filed by digit.

R11C Enter 1 if records are filed in a mechanical file.

R12A Enter 1 if serial filing is for open shelf file.
Enter 0 if serial filing is for drawer file.

R13A Enter value for the normal number of man-minutes to retrieve one medical record from mechanical file.

R14A Enter 1 if abstracted information is typed on form letter.
Enter 0 if abstracted information is handwritten on form letter.

R15A Enter 1 if Xerox copies of record are made.

R15B Enter 1 if thermofax copies of record are made.

R15C Enter 1 if SCM Electrostatic copies of record are made.

R16A Enter 1 if the completion of an accompanying letter from party requesting information is handwritten.
Enter 0 if the completion of an accompanying letter from party requesting information is typed.

R17A Enter 1 if amount owed to Medical Record Department for sending requested information is handwritten on bill form.
Enter 0 if amount owed to Medical Record Department for sending requested information is typed on bill form.

R18A Same as R11A.

R18B Same as R11B.

R18C Same as R11C.

R19A Same as R12A.

R20A Same as R13A.

R21A <u>Workdays per week</u>: Same as R7B.

R22A <u>Existing staff time per week</u>: This is the estimated staff man-hours per week spent on correspondence.

N. Outpatient

S1 Outpatient setups per day: This is the number of times per day that medical record personnel prepare to process or begin to process outpatient records. It should be estimated.

S2A Total yearly outpatients: Obtain the total number of outpatients treated in a year.

S2B Outpatient record workdays per year: Same as J5A.

S3A Total monthly deficient records: Count the number of incomplete outpatient records that must be completed by medical record personnel in a typical month.

S3B Workdays per month: This is the number of workdays per month that the outpatient section is staffed.

S4A Enter 1 if outpatient records are filed by serial.

S4B Enter 1 if outpatient records are filed by terminal digit.

S4C Enter 1 if outpatient records are filed in a mechanical file.

S5A Enter 1 if filing system is open shelf.
Enter 0 if filing system is drawer.

S6A Same as R13A.

S7A Workdays per month: Same as S3B.

S8A Existing staff time per week: This is the estimated staff man-hours per week spent on outpatient records.

O. <u>Emergency</u>

T1 <u>Emergency room set-ups per day</u>: Estimate the number of times per day that medical record personnel prepare to process or begin to process emergency room records.

T2A <u>Total yearly emergencies</u>: This refers to the number of records that have to be processed per day. Obtain the total number of emergencies in a year.

T2B <u>Workdays per year</u>: Same as J5A.

T3A Enter 1 if emergency records are filed by serial.

T3B Enter 1 if emergency records are filed by terminal digit.

T4A Enter 1 if filing system is an open shelf file.
Enter 0 if filing system is a drawer file.

T5A Same as R13A.

T6A <u>Workdays per week</u>: This is the number of days per week that the emergency section is staffed.

T7A <u>Existing staff time per week</u>: This is the estimated staff man-hours per week spent on emergency records.

APPENDIX B

SECTION 2

STAFFING METHOD PROGRAM LISTING

Written in FORTRAN IV to run on the UNIVAC 1108.

APPENDIX B

SECTION 2

STAFFING METHOD PROGRAM LISTING

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REAL I1,I2,I3,I4,I5,I6,I7,I7A,I8,I9,I10,I11,I12,I13,I14,I15,I16A
REAL I17A,I,IA,IB,IC,ID,IE,IFX,IG,ITSST,IDIFF
REAL J1,J1A,J2,J2A,J3,J3A,J4,J4A,J5,J5A,J6,J7,J7A,J8,J8A,J9,J9A
REAL J10,J10A,J11,J12,J13,J13A,J13B,J14,J15,J16,J17,J18,J19,J20
REAL J20A,J21,J22,J23,J24,J25,J26,J27,J28,J29A,J30A,J31A,J32A,J33A
REAL J34A,J35A,J36A,J37A,J38A,J39A,J40A,J41A,JA,JBA1,JBA2A,JBA2B
REAL JBA2C,JBA2,JBA2D,JBA2E,JBA3,JBA,JBB1,JBB2A,JBB2B,JBB2C,JBB2D
REAL JBB2E,JBB2,JBB,JC1,JC2,JC3,JC4,JC4A,JC4B,JC,JD1,JD2,JD3,JD4
REAL JD5,JD6,JD7,JD,J,JTSST,JDIFF
REAL K1,K1A,K1B,K2,K2A,K2B,K3,K4,K4A,K4B,K5,K6,K6A,K6B,K7,K7A,K7B
REAL K8,K8IA,K8IB,K8IIA,K8IIB,K9IA,K9,K10,K10IA,K10IB
REAL KA1,K11IA,K12IA,K24,K24A,KAII1A,KAII1B,KAII,KAI1
REAL KAI2A,KA,KAI2B,KAI2C,KB1,KB2A,KB2,KB3B,KB3A,KB3,KB,KC1
REAL KC2,KC3,KC4,KC5,KC,KDA,KDB,KD,KEI1,KEI2,KEI3,KEI4,KEI5,K11
REAL K12,KEI,KEII1,KEII2,K13,KE,KF1,KF2A,KF2B,KF2,KF,KF2C
REAL K41A,KF2D,KG1,KG2,KG3,KG4,KG,K14,K15,K16,K17,KH1,KH2,KH3,KH4
REAL KH5,KH6,KH7,KH,K18,K19,K20,K21,K22,K23,K32,K25,K26,K27,K28
REAL K29,K30,K31,K,K42A,K43A,KDIFF,KTSST,K13IIA,K13IIB,K14A,K14B
REAL K15A,K16A,K17A,K33A,K34A,K35A,K35B,K35C,K36A,K37A,K37B
REAL K37C,K37D,K37E,K38A,K39A,K40A,K40B,K40C,K40D
REAL L1,L2,L3,L4,L5,L6,L7,L8,L9,L10,LBI,LBII,LBIII,LB,LCI,LD,LEI
REAL LCII,LA,L8A,L8B,L9A,L10A,L10B,LEII1A,LEII1B,LEII1,LEII2,LEII
REAL LE,LF,L,LC,LTSST,LDIFF,L16A,L15A,L2A,L2B,L3A,L4A,L5A,L11A
REAL L11B,L11C,L12A,L12B,L13A,L14A
REAL M1,M2,M3,M4,M5,M6,M7,M8,M9,M10,M11,M12,M13,M14,M2A,M2B,M4A
REAL M4B,M6A,M6B,M8I,M8II,M8IA,M8IB,M8IIA,M8IIB,M9A,M10A,M11A,M12A
REAL MB1,M13A,M14A,M12B,M13B,M14B,MA,MB2,MB,MC1,MD2,MD2A,MD2B,MD2C
REAL MD2D,MD3,MD4,MD5A,MD5B,MD5C,MD5D,MD5,MD,ME1,ME2,ME,MF1,MF2
```

```
      REAL MF3,MF4A,MF4B,MF4,MF5,MF,M,MTSST,MDIFF,M20A,M21A,M15A,M15B
      REAL M15C,M15D,M15E,M16A,M16B,M16C,M16D,M17A,M17B,M17C,M17D,M18A
      REAL M19A
      REAL N1,N2,N3,N4,N5,N6,N2A,N2B,N3A,N3B,N3C,N3D,N4A,N4B,NA,NB1,NB2
      REAL NB3,NB,NC1A,NC1B,NC1,NC2A,NC2B,NC2,NC3A,NC3B,NC3C,NC3D,NC3E
      REAL NC3,NC,ND1A,ND1B,ND1C,ND1,ND2A1,ND2A2,ND2A,ND2B,ND2C1,ND2C2
      REAL ND2C3A,ND2C3B,ND2C3C,N14A,N11A,ND2C3,ND2C4A,ND2C4B,ND2C,ND2
      REAL ND,N,NTSST,NDIFF,N20A,N21A,N7A,N7B,N7C,N8A,N9A,N10A,N10B,N10C
      REAL N10D,N10E,N12A,N13A,N13B,N13C,N15A,N16A,N17A,N18A,N18B,N18C
      REAL N19A
10    READ (5,20) T01A
20    FORMAT (1F13.5)
30    READ (5,40)OR1,OR2,OR3
40    FORMAT (3F13.5)
50    READ (5,60) FP1,FP2,FP3,FP4,FP5,FP6,FP7,FP8,FP9,FP10,FP11,FP12
60    FORMAT (6F13.5)
70    READ (5,80)  I1,I2,I3,I4,I5,I6,I7A,I8,I9,I10,I11,I12,I13,I14,I15,
     1I16A,I17A
80    FORMAT (6F13.5)
90    READ (5,100) J1A,J2A,J3A,J4A,J5A,J6,J7A,J8A,J9A,J10A,J11,J12,J13A,
     1J13B,J14,J15,J16,J17,J18,J19,J20A,J21,J22,J23,J24,J25,J26,J27,J28,
     2J29A,J30A,J31A,J32A,J33A,J34A,J35A,J36A,J37A,J38A,J39A,J39B,J40A,
     3J41A
100   FORMAT (6F13.5)
110   READ (5,120) K1A,K1B,K2A,K2B,K3,K4A,K4B,K5,K6A,K6B,K7A,K7B,K8IA,
     1K8IB,K9IA,K10IA,K10IB,K11IA,K12IA,K8IIA,K8IIB,K13IIA,K13IIB,K14A,
     2K14B,K15A,K16A,K17A,K18,K19,K20,K21,K22,K23,K24A,K25,K26,K27,K28
     3K29,K30,K31,K32,K33A,K34A,K35A,K35B,K35C,K36A,K37A,K37B,K37C,K37D,
     4K37E,K38A,K39A,K40A,K40B,K40C,K40D,K41A,K42A,K43A
120   FORMAT (6F13.5)
130   READ (5,140) L1,L2A,L2B,L3A,L4A,L5A,L7,L8A,L8B,L9A,L10A,L10B,
     1L11A,L11B,L11C,L12A,L12B,L13A,L14A,L15A,L16A
140   FORMAT (6F13.5)
150   READ (5,160) M1,M2A,M2B,M3,M4A,M4B,M5,M6A,M6B,M7,M8IA,M8IB,M8IIA,
     1M8IIB,M9A,M10A,M11A,M12A,M12B,M13A,M13B,M14A,M14B,M15A,M15B,M15C,
```

```
     2M15D,M15E,M16A,M16B,M16C,M16D,M17A,M17B,M17C,M17D,M18A,M19A,M20A,
     3M21A
160   FORMAT (6F13.5)
170   READ (5,180) N1,N2A,N2B,N3A,N3B,N3C,N3D,N4A,N4B,N5,N6,N7A,N7B,N7C,
     1N8A,N9A,N10A,N10B,N10C,N10D,N10E,N11A,N12A,N13A,N13B,N13C,N14A,
     2N15A,N16A,N17A,N18A,N18B,N18C,N19A,N20A,N21A
180   FORMAT (6F13.5)
190   READ (5,200) O1A,O1B,O2A,O3,O4A,O4B,O4C,O4D,O4E,O5A,O6A,O7A,O7B,
     1O7C,O7D,O7E,O7F,O7G,O8A,O9A
200   FORMAT (6F13.5)
210   READ (5,220) P1,P2A,P2B,P3A,P4A,P4B,P5A,P5B,P6,P7,P8,P9,P10,P11,
     1P12,P13,P14,P15,P16,P17,P18,P19A,P20A,P20B,P20C,P20D,P20E,P20F,
     2P20G,P20H,P20I,P20J,P20K,P21A,P22A
220   FORMAT (6F13.5)
230   READ (5,240) Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8A,Q9A
240   FORMAT (6F13.5)
250   READ (5,260) R1,R2A,R2B,R3,R4A,R4B,R5,R6A,R7A,R7B,R8A,R9A,R10A,
     1R11A,R11B,R11C,R12A,R13A,R14A,R15A,R15B,R15C,R16A,R17A,R18A,R18B,
     2R18C,R19A,R20A,R21A,R22A
260   FORMAT (6F13.5)
270   READ (5,280) S1,S2A,S2B,S3A,S3B,S4A,S4B,S4C,S5A,S6A,S7A,S8A
280   FORMAT (6F13.5)
290   READ (5,300) T1,T2A,T2B,T3A,T3B,T3C,T4A,T5A,T6A,T7A
300   FORMAT (6F13.5)
310   IA=0.
320   IB=0.
330   IC=0.
340   ID=0.
350   IE=0.
360   IFX = 0.
370   IG=0.
380   I=0.
390   ITSST=0.
400   IDIFF=0.
410   IF (FP1) 530,530,420
```

```
420   I7 = 2*I7A
430   IA = 0.010*I3*I1 + 0.013*I4*I1
440   IB = 0.012*I7*I1 + 0.006*I5*I1 + 0.007*I6*I1
450   IC = 0.163*I2*I1
460   ID = 1.5*I8*I1 + 0.450*I9*I1 + 0.090*I10*I1
470   IE = 0.010*I11*I1 + 0.008*I12*I1
480   IFX = 0.672 * I13
490   IG = 0.202*I14 + 0.416*I15
500   I = IA + IB + IC + ID + IE + IFX + IG
510   ITSST = I*I16A*1.17/60
520   IDIFF = ITSST - I17A
530   JBA1=0.
540   JBA2=0.
550   JBA2A=0.
560   JBA2B=0.
570   JBA2C=0.
580   JBA2D=0.
590   JBA2E=0.
600   JBA3=0.
610   JBB1=0.
620   JBB2A=0.
630   JA=0.
640   JBB2B=0.
650   JBB2C=0.
660   JBB2D=0.
670   JBB2E=0.
680   JBB2=0.
690   JC1=0.
700   JC2=0.
710   JC3=0.
720   JC4=0.
730   JBA=0.
740   JC4A=0.
750   JC4B=0.
760   JD1=0.
```

```
770   JD2=0.
780   JD3=0.
790   JD4=0.
800   JD5=0.
810   JD6=0.
820   JBB=0.
830   JC=0.
840   JD=0.
850   J=0.
860   JDIFF=0.
870   JTSST=0.
880   JD7=0.
890   IF (FP2) 1580,1580,900
900   J1 = J1A/J5A
910   J2 = J2A/J5A
920   J3 = J3A/J5A
930   J4 = J4A/J5A
940   J5 = J1 + J2 + J3 + J4
950   J7 = J7A/30
960   J8 = J8A/30
970   J9 = J9A/30
980   J10= J10A/30
990   J13= J13A/J13B
1000  J20= J20A*2
1010  JA = 2.10*J6 + 0.188*J5
1020  IF (J29A) 1030,1030,1180
1030  JBA1 = 0.054*J7*J1 + 0.054*J8*J2 + 0.054*J9*J3 + 0.054*J10*J4
1040  IF (J30A) 1060,1060,1050
1050  JBA2A = 0.145*J5
1060  IF (J31A) 1080,1080,1070
1070  JBA2B = 0.165*J5
1080  IF (J32A) 1100,1100,1090
1090  JBA2C = 0.177*J5
1100  IF (J33A) 1120,1120,1110
```

```
1110  JBA2D = 0.223*J5
1120  IF (J34A) 1140,1140,1130
1130  JBA2E = 0.173*J5
1140  JBA2 = JBA2A + JBA2B + JBA2C + JBA2D + JBA2E
1150  JBA3 = 0.055*J7*J1 + 0.055*J8*J2 + 0.080*J9*J3 + 0.072*J10*J4
1160  JBA = JBA1 + JBA2 + JBA3
1170  GO TO 1310
1180  JBB1 = 0.188*J7*J1 + 0.188*J8*J2 + 0.264*J9*J3 + 0.256*J10*J4
1190  IF (J30A) 1210,1210,1200
1200  JBB2A = 0.145*J5
1210  IF (J31A) 1230,1230,1220
1220  JBB2B = 0.165*J5
1230  IF (J32A) 1250,1250,1240
1240  JBB2C = 0.177*J5
1250  IF (J33A) 1270,1270,1260
1260  JBB2D = 0.0223*J5
1270  IF (J34) 1290,1290,1280
1280  JBB2E = 0.173*J5
1290  JBB2 = JBB2A + JBB2B + JBB2C + JBB2D + JBB2E
1300  JBB = JBB1 + JBB2
1310  IF (J35A) 1330,1330,1320
1320  JC1 = 0.900*J11
1330  IF (J36A) 1350,1350,1340
1340  JC2 = 1.46*J12
1350  IF (J37A) 1370,1370,1360
1360  JC3 = 0.11*J13
1370  IF (J38A) 1390,1390,1380
1380  JC4 = 0.144*J13
1390  IF (J39A) 1410,1410,1400
1400  JC4A = 0.180*J13
1410  IF (J39B) 1430,1430,1420
1420  JC4B = 0.150*J13
1430  JC = JC1 + JC2 + JC3 + JC4A + JC4B
1440  JD1 = 0.010*J16*J14 + 0.013*J17*J14
1450  JD2 = 0.012*J20*J14 + 0.006*J18*J14 + 0.007*J19*J14
```

```
1460  JD3 = 0.163*J15*J14
1470  JD4 = 1.370*J21*J14 + 0.450*J22*J14 + 0.090*J23*J14 +0.130*J21*J14
1480  JD5 = 0.010*J24*J14 + 0.008*J25*J14
1490  JD6 = 0.672 * J26
1500  JD7 = 0.202*J27 + 0.416*J28
1510  JD = JD1 + JD2 + JD3 + JD4 + JD5 + JD6 + JD7
1520  IF (J29A) 1550,1550,1530
1530  J = JA + JBA + JC + JD
1540  GO TO 1560
1550  J = JA + JBB + JC + JD
1560  JTSST = J*J40A*1.17/60
1570  JDIFF = JTSST - J41A
1580  KA1=0.
1590  KAII1A=0.
1600  KAII1B=0.
1610  KAII=0.
1620  KAI1=0.
1630  KAI2A=0.
1640  KAI2B=0.
1650  KAI2C=0.
1660  KB1=0.
1670  KB2A=0.
1680  KA=0.
1690  KB2=0.
1700  KB3B=0.
1710  KB3A=0.
1720  KB3=0.
1730  KC1=0.
1740  KC2=0.
1750  KC3=0.
1760  KC4=0.
1770  KC5=0.
1780  KB=0.
1790  KDA=0.
1800  KDB=0.
```

```
1810  KEII=0.
1820  KEI2=0.
1830  KEI3=0.
1840  KEI4=0.
1850  KEI5=0.
1860  KEI=0.
1870  KEII1=0.
1880  KC=0.
1890  KEII=0.
1900  KEII2=0.
1910  KF1=0.
1920  KF2A=0.
1930  KF2B=0.
1940  KF2=0.
1950  KF2C=0.
1960  KF2D=0.
1970  KG1=0.
1980  KD=0.
1990  KG2=0.
2000  KG3=0.
2010  KG4=0.
2020  KH1=0.
2030  KH2=0.
2040  KH3=0.
2050  KH4=0.
2060  KH5=0.
2070  KH6=0.
2080  KE=0.
2090  KF=0.
3000  KG=0.
3010  KH=0.
3020  K=0.
3030  KDIFF=0.
3040  KTSST=0.
3050  KH7=0.
```

```
3060  IF (FP3) 10390,10390,3070
3070  K1 = K1A/K1B
3080  K2 = K2A/K2B
3090  K4 = K4A/K4B
4000  K6 = K6A/K6B
4010  K7 = K7A/K7B
4020  K14 = K14A / K14B
4030  K15 = K15A / K14B
4040  K16 = K16A / K14B
4050  K17 = K17A / K14B
4060  IF (K33A) 4070,4070,5000
4070  K8 = K8IIA/K8IIB
4080  K13= K13IIA/K13IIB
4090  GO TO 5040
5000  K8 = K8IA / K8IB
5010  K9 = K9IA/30
5020  K10 = K10IA/K10IB
5030  K11 = K11IA/30
5040  K24 = K24A*2
5050  K12 = K12IA/30
5060  IF (K34A) 5070,6030,5070
5070  IF (K35B) 5090,5090,5080
5080  KAII1A = 0.180*K2
5090  IF (K35C) 6010,6010,6000
6000  KAII1B = 0.150*K2
6010  KAII = KAII1A + KAII1B
6020  GO TO 7010
6030  KAI1 = 0.09*K2
6040  IF (K35A) 6060,6060,6050
6050  KAI2A= 0.082*K1
6060  IF (K35B) 6080,6080,6070
6070  KAI2B= 0.158*K1
6080  IF (K35C) 7000,7000,6090
6090  KAI2C= 0.132*K1
7000  KAI = KAI1 + KAI2A + KAI2B + KAI2C
```

```
7010  KA = KAI + KAII
7020  KB1 = 0.350*K3
7030  IF (K35C) 7060,7060,7040
7040  KB2B = 0.034*K4
7050  GO TO 7070
7060  KB2A = 0.038*K4
7070  KB2 = KB2A + KB2B
7080  IF (K36A) 8010,8010,7090
7090  KB3B = 0.06*K5*K6
8000  GO TO 8020
8010  KB3A = 0.08*K5*K6
8020  KB3 = KB3A + KB3B
8030  KB  = KB1 + KB2 + KB3
8040  IF (K37A) 8060,8060,8050
8050  KC1 = 0.090*K6
8060  IF (K37B) 8080,8080,8070
8070  KC2 = 0.060*K6
8080  IF (K37C) 9000,9000,8090
8090  KC3 = 0.320*K6
9000  IF (K37D) 9020,9020,9010
9010  KC4 = 0.100*K6
9020  IF (K37E) 9040,9040,9030
9030  KC5 = 0.300*K6
9040  KC = KC1 + KC2 + KC3 + KC4 + KC5
9050  IF (K38A) 9080,9060,9080
9060  KDA = 4.59*K7
9070  GO TO 9090
9080  KDB = 4.667*K7
9090  KD = KDA + KDB
10000 IF (K39A) 10120,10010,10120
10010 KEI1 = 0.963*K8
10020 KEI2 = 0.340*(K9-1.0)
10030 KEI3 = 0.670*K10
10040 KEI4 = 0.305*K11*K9*K8
10050 KEI5 = 0.191*K12*K9*K8
```

```
10060 KEI  = KEI1 + KEI2 + KEI3 + KEI4 + KEI5
10070 GO TO 10110
10080 KEII1 = 2.228*K8
10090 KEII2 = 1.40*K13
10100 KEII  = KEII1 + KEII2
10110 KE = KEI + KEII
10120 KF1 = 0.188*K8
10130 IF (K40A) 10150,10150,10140
10140 KF2A = 0.180 * K8
10150 IF (K40B) 10170,10170,10160
10160 KF2B = 0.150*K8
10170 IF (K40E) 10190,10190,10180
10180 KF2C = 0.258*(K8-K41A)
10190 IF (K40D) 10210,10210,10200
10200 KF2D = 0.082*(K8-K41A)
10210 KF2  = KF2A + KF2B + KF2C + KF2D
10220 KF  = KF1 + KF2
10230 KG1 = 0.475*K14
10240 KG2 = 0.825*K15
10250 KG3 = 1.025*K16
10260 KG4 = 0.873*K17
10270 KG  = KG1 + KG2 + KG3 + KG4
10280 KH1 = 0.010*K20 + 0.013*K21
10290 KH2 = 0.012*K24*K18 + 0.006*K22*K18 + 0.007*K23*K18
10300 KH3 = 0.163*K19*K18
10310 KH4 = 1.370*K25*K18 + 0.450*K26*K18 + 0.090*K27*K18 +0.130*K25*K18
10320 KH5 = 0.010*K28*K18 + 0.008*K29*K18
10330 KH6 = 0.672*K30
10340 KH7 = 0.202*K31 + 0.416*K32
10350 KH  = KH1 + KH2 + KH3 + KH4 + KH5 + KH6 + KH7
10360 K = KA + KB + KC + KD + KE + KF + KG + KH
10370 KTSST= K*K42A*1.17/60
10380 KDIFF= KTSST - K43A
10390 LBI=0.
10400 LBII=0.
```

```
10410 LBIII=0.
10420 LCI=0.
10430 LCII=0.
10440 LEI=0.
10450 LEII1A=0.
10460 LEII1B=0.
10470 LEII1=0.
10480 LEII2=0.
10490 LA=0.
10500 LB=0.
10510 LC=0.
10520 LD=0.
10530 LE=0.
10540 LF=0.
10550 L=0.
10560 LDIFF=0.
10570 LTSST=0.
10580 LEII=0.
10590 IF (FP4) 10980,10980,10600
10600 L8  = L8A/L8B
10610 L9  = L6*(L9A/30)
10620 L10 = L10A/L10B
10630 L2 = L2A / L2B
10640 L3 = L3A / L2B
10650 L4 = L4A / L2B
10670 L5 = L5A / L2B
10680 LA = 1.520*L1
10690 L6 = L2 + L3 + L4 + L5
10700 IF (L11A) 10720,10720,10710
10710 LBI = 0.589*L2 + 1.26*L3 + 1.65*L4 + 1.52*L5
10720 IF (L11B) 10740,10740,10730
10730 LBII= 1.556*L2 + 3.5*L3 + 3.9*L4 + 3.732*L5
10740 IF (L11C) 10760,10760,10750
10750 LBIII= 0.2115*L2 + 0.2025*L3 + 0.423*L4 + 0.282*L5
10760 LB  = LBI + LBII + LBIII
```

```
10770 IF (L12A) 10790,10790,10780
10780 LCI = 0.240*L2 + 0.43*L3 + 0.54*L4 + 0.445*L5
10790 IF (L12B) 10810,10810,10800
10800 LCII= 0.397*L2 + 0.397*L3 + 0.539*L4 + 0.521*L5
10810 LC  = LCI + LCII
10820 LD  = 2.10*L7
10830 IF (L13A) 10860,10860,10840
10840 LEI = 1.281*L2 + 1.922*L3 + 2.525*L4 + 2.68*L5 + 0.235*L6 + 2.61*L8
10850 GO TO 10930
10860 IF (L14A) 10890,10890,10870
10870 LEII1A= 0.08*L9
10880 GO TO 10900
10890 LEII1B= 0.06*L9
10900 LEII1 = LEII1A + LEII1B
10910 LEII2 = 0.161*L2 + 0.212*L3 + 0.225*L4 + 0.210*L5
10920 LEII = LEII1 + LEII2
10930 LE = LEI + LEII
10940 LF = 0.873*L10
10950 L = LA + LB + LC + LD + LE + LF
10960 LTSST = L*L15A*1.17/60
10970 LDIFF = LTSST - L16A
10980 MB1=0.
10990 MB2=0.
11000 MC1=0.
11010 MC2=0.
11020 MC3=0.
11030 MC4=0.
11040 MC5=0.
11050 MD1=0.
11060 MD2=0.
11070 MD2A=0.
11080 MA=0.
11090 MD2B=0.
11100 MD2C=0.
11110 MD2D=0.
```

```
11120 MD3=0.
11130 MD4=0.
11140 MD5A=0.
11150 MD5B=0.
11160 MD5C=0.
11170 MD5D=0.
11180 MB=0.
11190 MD5=0.
11200 ME1=0.
11210 ME2=0.
11220 MF1=0.
11230 MF2=0.
11240 MF3=0.
11250 MF4A=0.
11260 MF4B=0.
11270 MF4=0.
11280 MC=0.
11290 MD=0.
11300 ME=0.
11310 MF=0.
11320 M=0.
11330 MDIFF=0.
11340 MTSST=0.
11350 MF5=0.
11360 IF (FP5) 12030,12030,11370
11370 M2 = M2A/M2B
11380 M4 = M4A/M4B
11390 M6 = M6A/M6B
11400 M8I= M8IA/M8IB
11410 M8II=M8IIA/M8IIB
11420 M8 = M8I + M8II
11430 M9 = M9A/30
11440 M10= M10A/30
11450 M11= M11A/30
11460 M12= M12A/M12B
```

```
11470 M13= M13A/M13B
11480 M14= M14A/M14B
11490 MA = 1.036*M1
11500 MB1= 0.120*M2
11510 MB2= 0.051*M3*M2
11520 MB = MB1 + MB2
11530 IF (M15A) 11550,11550,11540
11540 MC1 = 0.044*M2
11550 IF (M15B) 11570,11570,11560
11560 MC2 = 0.310*M2
11570 IF (M15C) 11590,11590,11580
11580 MC3 = 0.205*M2
11590 IF (M15D) 11610,11610,11600
11600 MC4 = 0.363*M2
11610 IF (M15E) 11630,11630,11620
11620 MC5 = 0.240*M2
11630 MC  = MC1 + MC2 + MC3 + MC4 + MC5
11640 MD1 = 0.038*M4
11650 IF (M16A) 11670,11670,11660
11660 MD2A= 0.31*M4
11670 IF (M16B) 11690,11690,11680
11680 MD2B= 0.205*M4
11690 IF (M16C) 11710,11710,11700
11700 MD2C= 0.363*M4
11710 IF (M16D) 11730,11730,11720
11720 MD2D= 0.240*M4
11730 MD2 = MD2A + MD2B + MD2C + MD2D
11740 MD3 = 0.273*M6
11750 MD4 = 0.051*M5*M6
11760 IF (M17A) 11780,11780,11770
11770 MD5A= 0.310*M6
11780 IF (M17B) 11800,11800,11790
11790 MD5B= 0.205*M6
11800 IF (M17C) 11820,11820,11810
11810 MD5C= 0.363*M6
```

```
11820 IF (M17D) 11840,11840,11830
11830 MD5D= 0.240*M6
11840 MD5 = MD5A + MD5B + MD5C + MD5D
11850 MD  = MD1 + MD2 + MD3 + MD4 + MD5
11860 ME1 = 0.184*M6
11870 ME2 = 0.184*M6
11880 ME  = ME1 + ME2
11890 IF (M18A) 11930,11930,11900
11900 MF1 = 1.036*M7
11910 MF2 = 0.063*M8
11920 MF3 = 0.169*M12 + 0.141*M13 + 0.150*M14
11930 IF (M19A) 11960,11960,11940
11940 MF4A= 0.053*M9*M12 + 0.053*M10*M13 + 0.053*M11*M14
11950 GO TO 11970
11960 MF4B= 0.120*(M12+M13+M14) + 0.051*(M9*M12+M10*M13+M11*M14)
11970 MF4 = MF4A + MF4B
11980 MF5 = 0.169*M12 + 0.169*M13 + 0.150*M14
11990 MF  = MF1 + MF2 + MF3 + MF4 + MF5
12000 M   = MA + MB + MC + MD + ME + MF
12010 MTSST= M*M20A*1.17/60
12020 MDIFF= MTSST - M21A
12030 NB1=0.
12040 NB2=0.
12050 NB3=0.
12060 NC1A=0.
12070 NC1B=0.
12080 NC1=0.
12090 NC2A=0.
12100 NC2B=0.
12110 NC2=0.
12120 NC3A=0.
12130 NA=0.
12140 NC3B=0.
12150 NC3C=0.
12160 NC3D=0.
```

```
12170 NC3E=0.
12180 NC3=0.
12190 ND1A=0.
12200 ND1B=0.
12210 ND1C=0.
12220 ND1=0.
12230 NB=0.
12240 ND2A1=0.
12250 ND2A2=0.
12260 ND2A=0.
12270 ND2B=0.
12280 ND2C1=0.
12290 ND2C2=0.
12300 ND2C3A=0.
12310 ND2C3B=0.
12320 ND2C3C=0.
12330 NC=0.
12340 ND2C4A=0.
12350 ND2C3=0.
12360 ND2C4B=0.
12370 ND2C=0.
12380 ND=0.
12390 N=0.
12400 NDIFF=0.
12410 NTSST=0.
12420 ND2=0.
12430 IF (FP6) 13140,13140,12440
12440 N2  = N2A/N2B
12450 N3  = (N3A*N3C)/N3B/N3D
12460 N4  = N4A/N4B
12470 NA  = 2.100*N1
12480 IF (N7A) 12500,12500,12490
12490 NB1 = 0.145*N2 + 0.120*N2*N5
12500 IF (N7B) 12520,12520,12510
12510 NB2 = 0.120*N2 + 0.060*N2*N5
```

```
12520 IF (N7C) 12540,12540,12530
12530 NB3 = 0.164*N2
12540 NB  = NB1 + NB2 + NB3
12550 IF (N8A) 12580,12580,12560
12560 NC1A= 0.055*N3
12570 GO TO 12590
12580 NC1B= 0.190*N3
12590 NC1 = NC1A + NC1B
12600 IF (N9A) 12630,12630,12610
12610 NC2A= 0.111*N3
12620 GO TO 12640
12630 NC2B= 0.109*N3
12640 NC2 = NC2A + NC2B
12650 IF (N10A) 12670,12670,12660
12660 NC3A= 0.249*N3
12670 IF (N10B) 12690,12690,12680
12680 NC3B= 0.355*N3
12690 IF (N10C) 12710,12710,12700
12700 NC3C= 0.231*N3
12710 IF (N10D) 12730,12730,12720
12720 NC3D= 0.324*N3
12730 IF (N10E) 12750,12750,12740
12740 NC3E= N11A*N3
12750 NC3 = NC3A + NC3B + NC3C + NC3D + NC3E
12760 NC  = NC1 + NC2 + NC3
12770 IF (N12A) 13110,13110,12780
12780 IF (N13A) 12800,12800,12790
12790 ND1A= 0.310*N4
12800 IF (N13B) 12820,12820,12810
12810 ND1B= 0.237*N4
12820 IF (N13C) 12840,12840,12830
12830 ND1C= N14A*N4
12840 ND1 = ND1A + ND1B + ND1C
12850 IF (N15A) 12920,12920,12860
12860 IF (N16A) 12890,12890,12870
```

```
12870 ND2A1= 0.16*N4
12880 GO TO 12900
12890 ND2A2= 0.12*N4
12900 ND2A= ND2A1 + ND2A2
12910 GO TO 13090
12920 ND2B=0.100*N4
12930 IF (N17A) 12960,12960,12940
12940 ND2C1=0.145*N4
12950 GO TO 12970
12960 ND2C2=0.125*N4
12970 IF (N18A) 12990,12990,12980
12980 ND2C3A= 0.310*N4
12990 IF (N18B) 13010,13010,13000
13000 ND2C3B= 0.237*N4
13010 IF (N18C) 13030,13030,13020
13020 ND2C3C= N14A*N4
13030 ND2C3= ND2C3A + ND2C3B + ND2C3C
13040 IF (N19A) 13070,13070,13050
13050 ND2C4A= 0.145*N4 + 0.120*N4*N6
13060 GO TO 13080
13070 ND2C4B= 0.120*N4 + 0.060*N4*N6
13080 ND2C= ND2C1 + ND2C2 + ND2C3 + ND2C4A + ND2C4B
13090 ND2 = ND2A + ND2B + ND2C
13100 ND  = ND1 + ND2
13110 N   = NA + NB + NC + ND
13120 NTSST=N*N20A*1.17/60
13130 NDIFF=NTSST - N21A
13140 OA1=0.
13150 OA2A=0.
13160 OA2B=0.
13170 OA2C=0.
13180 OA2D=0.
13190 OA2E=0.
13200 OA2=0.
13210 OB1A=0.
```

```
13220 OB1B=0.
13230 OB1=0.
13240 OA=0.
13250 OB2=0.
13260 OB3=0.
13270 OC1=0.
13280 OC2=0.
13290 OC3=0.
13300 OC4=0.
13310 OC5=0.
13320 OC6=0.
13330 OB=0.
13340 OC=0.
13350 O=0.
13360 ODIFF=0.
13370 OTSST=0.
13380 OC7=0.
13390 IF (FP7) 13810,13810,13400
13400 O1  = O1A/O1B
13410 O2  =(O2A/30)*O1
13420 OA1 = O1*0.213
13430 IF (O4A) 13450,13450,13440
13440 OA2A= 0.310*O1
13450 IF (O4B) 13470,13470,13460
13460 OA2B= 0.249*O1
13470 IF (O4C) 13490,13490,13480
13480 OA2C= O5A*O1
13490 IF (O4D) 13510,13510,13500
13500 OA2D= 0.324*O1
13510 IF (O4E) 13530,13530,13520
13520 OA2E= 0.231*O1
13530 OA2 = OA2A + OA2B + OA2C + OA2D + OA2E
13540 OA  = OA1 + OA2
13550 IF (O6A) 13600,13580,13560
13560 OB1A= 0.356*O1
```

```
13570 GO TO 13590
13580 OB1B= 0.120*01 + 0.137*01
13590 OB1 = OB1A + OB1B
13600 OB2 = 0.059*01
13610 OB3 = 0.050*03
13620 OB  = OB1 + OB2 + OB3
13630 IF (07A) 13650,13650,13640
13640 OC1 = 0.087*01
13650 IF (07B) 13670,13670,13660
13660 OC2 = 0.056*01
13670 IF (07C) 13690,13690,13680
13680 OC3 = 0.331*01
13690 IF (07D) 13710,13710,13700
13700 OC4 = 0.058*01
13710 IF (07E) 13730,13730,13720
13720 OC5 = 0.140*01
13730 IF (07F) 13750,13750,13740
13740 OC6 = 0.33*02
13750 IF (07G) 13770,13770,13760
13760 OC7 = 0.221*01
13770 OC  = OC1 + OC2 + OC3 + OC4 + OC5 + OC6 + OC7
13780 O   = OA + OB + OC
13790 OTSST= 0*08A*1.17/60
13800 ODIFF= OTSST - 09A
13810 PB1=0.
13820 PB2=0.
13830 PB3=0.
13840 PB4=0.
13850 PC1=0.
13860 PC2=0.
13870 PC3=0.
13880 PC4=0.
13890 PC5=0.
13900 PC6=0.
13910 PA=0.
```

```
13920 PC7=0.
13930 PC8=0.
13940 PC9=0.
13950 PC10=0.
13960 PC11=0.
13970 PD1=0.
13980 PD2=0.
13990 PD3=0.
14000 PD4=0.
14010 PB=0.
14020 PC=0.
14030 PD=0.
14040 P=0.
14050 PDIFF=0.
14060 PTSST=0.
14070 PD5=0.
14080 IF (FP8) 14530,14530,14090
14090 P2 = P2A/P2B
14100 P3 = P3A/50
14110 P4 = P4A/P4B
14120 P5 = P5A/P5B
14130 PA = 2.10*P1
14140 IF (P19A) 14170,14170,14150
14150 PB1 = 0.080*P2*P3
14160 GO TO 14180
14170 PB2 = 0.180*P2 + 0.060*P2*P3
14180 PB3 = 0.143*P4
14190 PB4 = 0.480*P2
14200 PB = PB1 + PB2 +PB3 +PB4
14210 IF (P20A) 14230,14230,14220
14220 PC1 = 0.470*P5
14230 IF (P20B) 14250,14250,14240
14240 PC2 = 4.15*P5
14250 IF (P20C) 14270,14270,14260
14260 PC3 = 0.526*P5
```

```
14270 IF (P20D) 14290,14290,14280
14280 PC4 = 0.440*P5
14290 IF (P20E) 14310,14310,14300
14300 PC5 = 2.240*P5
14310 IF (P20F) 14330,14330,14320
14320 PC6 = 0.391*P5
14330 IF (P20G) 14350,14350,14340
14340 PC7 = 0.300*P5
14350 IF (P20H) 14370,14370,14360
14360 PC8 = 0.090*P5
14370 IF (P20I) 14390,14390,14380
14380 PC9 = 0.060*P5
14390 IF (P20J) 14410,14410,14400
14400 PC10 = 0.136*P5
14410 IF (P20K) 14430,14430,14420
14420 PC11 = 0.057*P5
14430 PC = PC1 + PC2 + PC3 + PC4 + PC5 + PC6 + PC 7 + PC 8 + PC9+PC10+PC11
14440 PD1 = 0.010*P8*P7 + 0.013*P9*P7
14450 PD2 = 1.370*P11*P7 + 0.450*P12*P7 + 0.090*P13*P7 + 0.180*P11*P7
14460 PD3 = 0.010*P14*P7 + 0.008*P15*P7
14470 PD4 = 0.672*P16
14480 PD5 = 0.202*P17 + 0.416*P18
14490 PD = PD1 + PD2 + PD3 + PD4 + PD5
14500 P = PA + PB + PC + PD
14510 PTSST = P*P21A*1.17/60
14520 PDIFF = PTSST - P22A
14530 QA1=0.
14540 QA2=0.
14550 QA3=0.
14560 QA4=0.
14570 QB1=0.
14580 QB2=0.
14590 QA=0.
14600 QB=0.
14610 Q=0.
```

```
14620 QDIFF=0.
14630 QTSST=0.
14640 QB3=0.
14650 IF (FP9) 14780,14780,14660
14660 QA1 = 0.464*Q1
14670 QA2 = 0.675*Q2
14680 QA3 = 0.598*Q3
14690 QA4 = 1.785*Q4
14700 QA = QA1 + QA2 + QA3 + QA4
14710 QB1 = 0.821*Q5
14720 QB2 = 0.500*Q6
14730 QB3 = 0.793*Q7
14740 QB  = QB1 + QB2 + QB3
14750 Q   = QA + QB
14760 QTSST= Q*Q8A*1.17/60
14770 QDIFF= QTSST - Q9A
14780 RB1=0.
14790 RB2A=0.
14800 RB2B=0.
14810 RB2=0.
14820 RB3=0.
14830 RB4A=0.
14840 RB4B1=0.
14850 RB4B2=0.
14860 RB4B4=0.
14870 RB4B3=0.
14880 RA=0.
14890 RB4=0.
14900 RC1=0.
14910 RC2A1=0.
14920 RC2A2=0.
14930 RC2A=0.
14940 RC2B1=0.
14950 RC2B2=0.
14960 RC2B=0.
```

```
14970 RC2C=0.
14980 RB=0.
14990 RC2=0.
15000 RC3A=0.
15010 RC3B=0.
15020 RC3=0.
15030 RC4=0.
15040 RC5A=0.
15050 RC5B=0.
15060 RC5C=0.
15070 RC5=0.
15080 RC=0.
15090 RC6=0.
15100 RC7A=0.
15110 RC7B=0.
15120 RC7=0.
15130 RC8=0.
15140 RC9A=0.
15150 RC9B=0.
15160 RC9C=0.
15170 RC9=0.
15180 RD=0.
15190 RD1=0.
15200 RD2A1=0.
15210 RD2A2=0.
15220 RD2A=0.
15230 RD2B1=0.
15240 RD2B2=0.
15250 RD2B=0.
15260 RD2C=0.
15270 RD2=0.
15280 R=0.
15290 RC10=0.
15300 RDIFF=0.
15340 RTSST=0.
```

```
15350 RD3=0.
15360 IF (FP10) 16250,16250,15370
15370 R2 = R2A/R2B
15380 R4 = R4A/R4B
15390 R6 = R6A/30
15400 R7 = R7A/R7B
15410 RA = 1.029*R1
15420 RB1 = 0.385*R2
15430 IF (R8A) 15460,15460,15440
15440 RB2A = 0.08*R2*R3
15450 GO TO 15470
15460 RB2B = 0.06*R2*R3
15470 RB2 = RB2A + RB2B
15480 RB3 = 2.087*R2
15490 IF (R9A) 15520,15520,15500
15500 RB4A = 1.081*R4
15510 GO TO 15580
15520 IF (R10A) 15560,15560,15530
15530 RB4B1 = 0.08*R5*R4
15540 RB4B4 = 0.820*R4
15550 GO TO 15580
15560 RB4B2 = 0.06*R5*R4
15570 RB4B3 = 0.71*R4
15580 RB4A + RB4B1 + RB4B2 + RB4B3 + RB4B4
15590 RB = RB1 + RB2 + RB3 + RB4
15600 RC1 = 0.456*R2
15610 IF (R11A) 15670,15670,15620
15620 IF (R12A) 15650,15650,15630
15630 RC2A1 = 0.249*R2
15640 GO TO 15660
15650 RC2A2 = 0.355*R2
15660 RC2A  = RC2A1 + RC2A2
15670 IF (R11B) 15730,15630,15680
15680 IF (R12A) 15710,15710,15690
15690 RC2B1 = 0.231*R2
```

```
15700 GO TO 15720
15710 RC2B2= 0.324*R2
15720 RC2B = RC2B1 + RC2B2
15730 IF (R11C) 15750,15750,15740
15740 RC2C = R13A*R2
15750 RC2 = RC2A + RC2B + RC2C
15760 IF (R14A) 15790,15790,15770
15770 RC3A = 0.090*R2*R3
15780 GO TO 15800
15790 RC3B = 0.120*R2*R3
15800 RC3  = RC3A + RC3B
15810 RC4  = 0.343*R2*R6
15820 IF (R15A) 15840,15840,15830
15830 RC5A = 0.207*R2*R6
15840 IF (R15B) 15860,15860,15850
15850 RC5B = 0.320*R2*R6
15860 IF (R15C) 15880,15880,15870
15870 RC5C = 0.332*R2*R6
15880 RC5  = RC5A + RC5B + RC5C
15890 RC6  = 0.136*R2
15900 IF (R16A) 15930,15930,15910
15910 RC7A = 0.080*R3*R2
15920 GO TO 15940
15930 RC7B = 0.060*R3*R2
15940 RC7  = RC7A + RC7B
15950 RC8  = 0.508*R2
15960 RC9A = 0.050*R2
15970 IF (R17A) 16000,16000,15980
15980 RC9B = 0.08*R2
15990 GO TO 16010
16000 RC9C = 0.06*R2
16010 RC9  = RC9A + RC9B + RC9C
16020 RC10 = 0.300*R2 + 0.394*R2
16030 RC = RC1 + RC2 + RC3 + RC4 + RC5 + RC6 + RC7 + RC8 + RC9 + RC10
```

```
16040 RD1 = 1.487*R7
16050 IF (R18A) 16110,16110,16060
16060 IF (R19A) 16090,16090,16070
16070 RD2A1 = 0.249*R7
16080 GO TO 16100
16090 RD2A2 = 0.310*R7
16100 RD2A  = RD2A1 + RD2A2
16110 IF (R18B) 16170,16170,16120
16120 IF (R19A) 16150,16150,16130
16130 RD2B1 = 0.231*R7
16140 GO TO 16160
16150 RD2B2 = 0.324*R7
16160 RD2B  = RD2B1 + RD2B2
16170 IF (R18C) 16190,16190,16180
16180 RD2C  = R20A*R7
16190 RD2 = RD2A + RD2B + RD2C
16200 RD3 = 0.750*R7
16210 RD  = RD1 + RD2 + RD3
16220 R   = RA + RB + RC + RD
16230 RTSST = R*R21A*1.17/60
16240 RDIFF = RTSST - R22A
16250 SB1=0.
16260 SB2=0.
16270 SB3A1=0.
16280 SB3A2=0.
16290 SB3A=0.
16300 SB3B1=0.
16310 SB3B2=0.
16320 SB3B=0.
16330 SB3C=0.
16340 SA=0.
16350 SB=0.
16360 S=0.
16370 SDIFF=0.
16380 STSST=0.
```

```
16390 SB3=0.
16400 IF (FP11) 16650,16650,16410
16410 S2 = S2A/S2B
16420 S3 = S3A/S3B
16430 SA = 2.100*S1
16440 SB1= 0.376*S2
16450 SB2= 0.821*S3
16460 IF (S4A) 16520,16520,16470
16470 IF (S5A) 16500,16500,16480
16480 SB3A1 = 0.249*S2
16490 GO TO 16510
16500 SB3A2 = 0.355*S2
16510 SB3A = SB3A1 + SB3A2
16520 IF (S4B) 16580,16580,16530
16530 IF (S5A) 16560,16560,16540
16540 SB3B1= 0.231*S2
16550 GO TO 16570
16560 SB3B2= 0.324*S2
16570 SB3B = SB3B1 + SB3B2
16580 IF (S4C) 16600,16600,16590
16590 SB3C = S6A*S2
16600 SB3  = SB3A + SB3B + SB3C
16610 SB   = SB1 + SB2 + SB3
16620 S = SA + SB
16630 STSST= S*S7A*1.17/60
16640 SDIFF= STSST - S8A
16650 TB1=0.
16660 TB2A1=0.
16670 TB2A2=0.
16680 TB2A=0.
16690 TB2B1=0.
16700 TB2B2=0.
16710 TB2B=0.
16720 TB2C=0.
16730 TA=0.
```

```
16740 TB=0.
16750 T=0.
16760 TDIFF=0.
16770 TTSST=0.
16780 TB2=0.
16790 IF (FP12) 17020,17020,16800
16800 T2  = T2A/T2B
16810 TA  = 2.100*T1
16820 TB1 = 0.684*T2
16830 IF (T3A) 16890,16890,16840
16840 IF (T4A) 16870,16870,16850
16850 TB2A1 = 0.249*T2
16860 GO TO 16880
16870 TB2A2 = 0.355*T2
16880 TB2A = TB2A1 + TB2A2
16890 IF (T3B) 16950,16950,16900
16900 IF (T4A) 16930,16930,16910
16910 TB2B1 = 0.231*T2
16920 GO TO 16940
16930 TB2B2 = 0.324*T2
16940 TB2B = TB2B1 + TB2B2
16950 IF (T3C) 16970,16970,16960
16960 TB2C = T5A*T2
16970 TB2  = TB2A + TB2B + TB2C
16980 TB = TB1 + TB2
16990 T  = TA + TB
17000 TTSST = T*T6A*1.17/60
17010 TDIFF = TTSST - T7A
17020 TOTSST= ITSST + JTSST + KTSST + LTSST + MTSST + NTSST + OTSST +
     1PTSST + QTSST + RTSST + STSST + TTSST
17030 TODIFF = TOTSST - TO1A
17040 WRITE (6,17050)
17050 FORMAT (1H1,////,51X,'HOSPITAL')
17060 IF (OR1) 18850,18850,17070
```

```
17070 WRITE (6,17080)
17080 FORMAT (1H1,//,53X,'RECORD PICKUP')
17090 WRITE (6,17100)
17100 FORMAT (//,81X,'MAN MINUTES PER DAY')
17110 WRITE (6,17120) IA
17120 FORMAT (/,20X,'WALKING TIME',54X,F10.2)
17130 WRITE (6,17140) IB
17140 FORMAT (/,20X,'PUSHING CART',54X,F10.2)
17150 WRITE (6,17160) IC
17160 FORMAT (/,20X,'PICKUP AND SIGN FOR RECORDS',39X,F10.2)
17170 WRITE (6,17180) ID
17180 FORMAT (/,20X,'TAKING ELEVATOR',51X,F10.2)
17190 WRITE (6,17200) IE
17200 FORMAT (/,20X,'STAIRWAY TRAVEL',51X,F10.2)
17210 WRITE (6,17220) IFX
17220 FORMAT (/,20X,'PICKUP RECORDS FROM DUMBWAITER',36X,F10.2)
17230 WRITE (6,17240) IG
17240 FORMAT (/,20X,'TRANSPORT RECORDS THROUGH PNEUMATIC TUBE',26X,
     1F10.2)
17250 WRITE (6,17260) I
17260 FORMAT (//,20X,'TOTAL TIME FOR RECORD PICKUP',38X,F10.2)
17270 WRITE (6,17280)
17280 FORMAT (1H1,//,46X,'RECORD ASSEMBLY AND ANALYSIS')
17290 WRITE (6,17300)
17300 FORMAT (//,81X,'MAN MINUTES PER DAY')
17310 WRITE (6,17320) JA
17320 FORMAT (/,20X,'PREPARE RECORDS FOR ASSEMBLY AND ANALYSIS',25X,
     1F10.2)
17330 WRITE (6,17340) JBA
17340 FORMAT (/,20X,'ASSEMBLY AND ANALYSIS - SEPARATE METHOD',27X,F10.2)
17350 WRITE (6,17360) JBB
17360 FORMAT (/,20X,'ASSEMBLY AND ANALYSIS - COMBINED METHOD',27X,F10.2)
17370 WRITE (6,17380) JC
17380 FORMAT (/,20X,'COMPLETE RECORDS LEFT INCOMPLETE BY NURSES',24X,
     1F10.2)
```

```
17390 WRITE (6,17400) JD
17400 FORMAT (/,20X,'TRANSPORTATION DURING ASSEMBLY AND ANALYSIS',23X,
     1F10.2)
17410 WRITE (6,17420) J
17420 FORMAT (//,20X,'TOTAL TIME FOR RECORD ASSEMBLY AND ANALYSIS',23X,
     1F10.2)
17430 WRITE (6,17440)
17440 FORMAT (1H1,//,53X,'TRANSCRIPTION')
17450 WRITE (6,17460)
17460 FORMAT (//,81X,'MAN MINUTES PER DAY')
17470 WRITE (6,17480) KA
17480 FORMAT (/,20X,'SORT AND DISTRIBUTE INCOMPLETE RECORDS',28X,F10.2)
17490 WRITE (6,17500) KB
17500 FORMAT (/,20X,'ASSIST AND PREPARE DOCTORS REPORTS',32X,F10.2)
17510 WRITE (6,17520) KC
17520 FORMAT (/,20X,'DISTRIBUTE NOTES TO DOCTORS',39X,F10.2)
17530 WRITE (6,17540) KD
17540 FORMAT (/,20X,'PREPARE BELTS OR DISCS FOR TRANSCRIPTIONS',25X,
     1F10.2)
17550 WRITE (6,17560) KE
17560 FORMAT (/,20X,'TRANSCRIPTION',53X,F10.2)
17570 WRITE (6,17580) KF
17580 FORMAT (/,20X,'SORT AND FILE TYPED REPORTS',39X,F10.2)
17590 WRITE (6,17600) KG
17600 FORMAT (/,20X,'FINAL COMPLETION CHECK OF RECORD',34X,F10.2)
17610 WRITE (6,17620) KH
17620 FORMAT (/,20X,'TRANSPORTATION DURING TRANSCRIPTION ACTIVITIES',20X,
     1F10.2)
17630 WRITE (6,17640) K
17640 FORMAT (/,20X,'TOTAL TIME FOR TRANSCRIPTION',38X,F10.2)
17650 WRITE (6,17660)
17660 FORMAT (1H1,//,49X,'CODING AND ABSTRACTING')
17670 WRITE (6,17680)
17680 FORMAT (//,81X,'MAN MINUTES PER DAY')
```

```
17690 WRITE (6,17700) LA
17700 FORMAT (/,20X,'SETUP AND CLEANUP FOR CODING',38X,F10.2)
17710 WRITE (6,17720) LB
17720 FORMAT (/,20X,'CODING',60X,F10.2)
17730 WRITE (6,17740) LC
17740 FORMAT (/,20X,'CHECK CODING WITH WRITTEN DIAGNOSIS',31X,F10.2)
17750 WRITE (6,17760) LD
17760 FORMAT (/,20X,'SETUP FOR ABSTRACTING',45X,F10.2)
17770 WRITE (6,17780) LE
17780 FORMAT (/,20X,'ABSTRACTING',55X,F10.2)
17790 WRITE (6,17800) LF
17800 FORMAT (/,20X,'CHECKING STATISTICAL REPORTS FOR COMPLETION',23X,
     1F10.2)
17810 WRITE (6,17820) L
17820 FORMAT (/,20X,'TOTAL TIME FOR CODING AND ABSTRACTING',29X,F10.2)
17830 WRITE (6,17840)
17840 FORMAT (1H1,//,56X,'INDEXING')
17850 WRITE (6,17860)
17860 FORMAT (//,81X,'MAN MINUTES PER DAY')
17870 WRITE (6,17880) MA
17880 FORMAT (/,20X,'SETUP FOR MASTER PATIENT FILE INDEXING',28X,F10.2)
17890 WRITE (6,17900) MB
17900 FORMAT (/,20X,'TYPE CARDS FOR NEW ADMISSIONS',37X,F10.2)
17910 WRITE (6,17920) MC
17920 FORMAT (/,20X,'FILE NEW ADMISSIONS',47X,F10.2)
17930 WRITE (6,17940) MD
17940 FORMAT (/,20X,'UPDATE MASTER PATIENT INDEX FOR DISCHARGES/READMISS
     1IONS',11X,F10.2)
17950 WRITE (6,17960) ME
17960 FORMAT (/,20X,'IN-HOUSE FILING AND RETRIEVING - MASTER PATIENT IND
     1EX',13X,F10.2)
17970 WRITE (6,17980) MF
17980 FORMAT (/,20X,'MAINTENANCE OF SECONDARY INDICES',34X,F10.2)
17990 WRITE (6,18000) M
18000 FORMAT (/,20X,'TOTAL TIME FOR INDEXING',43X,F10.2)
```

```
18010 WRITE (6,18020)
18020 FORMAT (1H1,//,45X,'NUMBERING AND FILING OF RECORDS')
18030 WRITE (6,18040)
18040 FORMAT (//,81X,'MAN MINUTES PER DAY')
18050 WRITE (6,18060) NA
18060 FORMAT (/,20X,'SETUP FOR FILING',50X,F10.2)
18070 WRITE (6,18080) NB
18080 FORMAT (/,20X,'PREPARE RECORD FOLDERS FOR NEW ADMISSIONS',25X,
     1F10.2)
18090 WRITE (6,18100) NC
18100 FORMAT (/,20X,'INSERT RECORD IN FOLDER AND FILE',34X,F10.2)
18110 WRITE (6,18120) ND
18120 FORMAT (/,20X,'UPDATE RECORD FOLDERS FOR READMISSIONS',28X,F10.2)
18130 WRITE (6,18140) N
18140 FORMAT (/,20X,'TOTAL TIME FOR NUMBERING AND FILING',31X,F10.2)
18150 WRITE (6,18160)
18160 FORMAT (1H1,//,41X,'RETRIEVAL AND RECORD LOCATION CONTROL')
18170 WRITE (6,18180)
18180 FORMAT (//,81X,'MAN MINUTES PER DAY')
18190 WRITE  (6,18200) OA
18200 FORMAT (/,20X,'FIND AND RETRIEVE RECORDS FROM FILE',31X,F10.2)
18210 WRITE (6,18220) OB
18220 FORMAT (/,20X,'REPLACE RECORDS RETRIEVED WITH AN OUTGUIDE',24X,
     1F10.2)
18230 WRITE (6,18240) OC
18240 FORMAT (/,20X,'MAINTAIN CONTROL CARD FILE OR LOG FOR OUT RECORDS',
     117X,F10.2)
18250 WRITE (6,18260) O
18260 FORMAT (/,20X,'TOTAL TIME FOR RETRIEVAL AND RECORD LOCATION CONTRO
     1L',14X,F10.2)
18270 WRITE (6,18280)
18280 FORMAT (1H1,//,34X,'PREPARING STATISTICAL REPORTS AND BIRTH CERTIF
     1ICATES')
18290 WRITE (6,18300)
18300 FORMAT (//,81X,'MAN MINUTES PER DAY')
```

```
18310 WRITE (6,18320) PA
18320 FORMAT (/,20X,'SETUP FOR STATISTICAL REPORTS',37X,F10.2)
18330 WRITE (6,18340) PB
18340 FORMAT (/,20X,'COPY DATA FROM RECORDS AND FILE COMPLETED REPORTS',
     117X,F10.2)
18350 WRITE (6,18360) PC
18360 FORMAT (/,20X,'PREPARE BIRTH CERTIFICATES',40X,F10.2)
18370 WRITE (6,18380) PD
18380 FORMAT (/,20X,'TRANSPORTATION TO PREPARE REPORTS OR CERTIFICATES',
     117X,F10.2)
18390 WRITE (6,18400) P
18400 FORMAT (/,20X,'TOTAL TIME FOR REPORTS AND CERTIFICATES',27X,F10.2)
18410 WRITE (6,18420)
18420 FORMAT (1H1,34X,'INCOMING AND OUTGOING PHONE CALLS FOR MISSING REC
     1ORDS')
18430 WRITE (6,18440)
18440 FORMAT (//,81X,'MAN MINUTES PER DAY')
18450 WRITE (6,18460) QA
18460 FORMAT (/,20X,'ANSWER INCOMING PHONE CALLS',39X,F10.2)
18470 WRITE (6,18480) QB
18480 FORMAT (/,20X,'MAKE OUTGOING PHONE CALLS',41X,F10.2)
18490 WRITE (6,18500) Q
18500 FORMAT (/,20X,'TOTAL TIME FOR PHONE CALLS',40X,F10.2)
18510 WRITE (6,18520)
18520 FORMAT (1H1,//,35X,'CORRESPONDENCE AND IN-PERSON INFORMATION REQUE
     1STS')
18530 WRITE (6,18540)
18540 FORMAT (//,81X,'MAN MINUTES PER DAY')
18550 WRITE (6,18560) RA
18560 FORMAT (/,20X,'SETUP AND CLEANUP FOR CORRESPONDENCE',30X,F10.2)
18570 WRITE (6,18580) RB
18580 FORMAT (/,20X,'COPY AND VERIFY A REQUEST FOR MEDICAL RECORDS INFO.
     1',15X,F10.2)
18590 WRITE (6,18600) RC
18600 FORMAT (/,20X,'ANSWER VERIFIED REQUESTS',42X,F10.2)
```

```
18610 WRITE (6,18620) RD
18620 FORMAT (/,20X,'IN-PERSON REQUESTS',48X,F10.2)
18630 WRITE (6,18640) R
18640 FORMAT (/,20X,'TOTAL TIME FOR CORRESPONDENCE AND IN-PERSON INFO. R
     1EQ.',12X,F10.2)
18650 WRITE (6,18660)
18660 FORMAT (1H1,//,51X,'OUT-PATIENT RECORDS')
18670 WRITE (6,18680)
18680 FORMAT (//,81X,'MAN MINUTES PER DAY')
18690 WRITE (6,18700) SA
18700 FORMAT (/,20X,'SETUP FOR OUT-PATIENT RECORDS',37X,F10.2)
18710 WRITE (6,18720) SB
18720 FORMAT (/,20X,'PROCESS OUT-PATIENT RECORDS',39X,F10.2)
18730 WRITE (6,18740) S
18740 FORMAT (/,20X,'TOTAL TIME FOR OUT-PATIENT RECORDS',32X,F10.2)
18750 WRITE (6,18760)
18760 FORMAT (1H1,//,49X 'EMERGENCY ROOM RECORDS')
18770 WRITE (6,18780)
18780 FORMAT (//,81X,'MAN MINUTES PER DAY')
18790 WRITE (6,18800) TA
18800 FORMAT (/,20X,'SETUP TO PROCESS EMERGENCY ROOM REPORTS',32X,F10.2)
18810 WRITE (6,18820) TB
18820 FORMAT (/,20X,'ASSEMBLE,ANALYZE, AND FILE EMERGENCY ROOM RECORDS',
     122X,F10.2)
18830 WRITE (6,18840) T
18840 FORMAT (/,20X,'TOTAL TIME FOR EMERGENCY ROOM RECORDS',34X,F10.2)
18850 IF (OR2) 19200,19200,18860
18860 WRITE (6,18870)
18870 FORMAT (1H1,//,27X,'STANDARD STAFF TIME, EXISTING STAFF TIME, AND
     1DIFFERENCES BY AREA')
18880 WRITE (6,18890)
18890 FORMAT (//,81X,'MAN HOURS PER WEEK')
18900 WRITE (6,18910) ITSST
18910 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME RECORD PICKUP',27X,
     1F10.2)
```

```
18920 WRITE (6,18930) I17A
18930 FORMAT (/,20X,'EXISTING STAFF TIME FOR RECORD PICKUP',29X,F10.2)
18940 WRITE (6,18950) IDIFF
18950 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR RECORD PICKUP',22X,
     1F10.2)
18960 WRITE (6,18970) JTSST
18970 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR ASSEMBLY AND ANALYSI
     1S',15X,F10.2)
18980 WRITE (6,18990) J41A
18990 FORMAT (/,20X,'EXISTING STAFF TIME FOR ASSEMBLY AND ANALYSIS',21X,
     1F10.2)
19000 WRITE (6,19010) JDIFF
19010 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR ASSEMBLY AND ANALYSI
     1S',14X,F10.2)
19020 WRITE (6,19030) KTSST
19030 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR TRANSCRIPTION',23X,
     1F10.2)
19040 WRITE (6,19050) K43A
19050 FORMAT (/,20X,'EXISTING STAFF TIME FOR TRANSCRIPTION',29X,F10.2)
19060 WRITE (6,19070) KDIFF
19070 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR TRANSCRIPTION',22X,
     1F10.2)
19080 WRITE (6,19090) LTSST
19090 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR CODING AND ABSTRACTI
     1NG',14X,F10.2)
19100 WRITE (6,19110) L16A
19110 FORMAT (/,20X,'EXISTING STAFF TIME FOR CODING AND ABSTRACTING',20X
     1,F10.2)
19120 WRITE (6,19130) LDIFF
19130 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR CODING AND ABSTRACTI
     1NG',13X,F10.2)
19140 WRITE (6,19150) MTSST
19150 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR INDEXING',28X,F10.2)
19160 WRITE (6,19170) M21A
19170 FORMAT (/,20X,'EXISTING STAFF TIME FOR INDEXING',34X,F10.2)
```

```
19180 WRITE (6,19190) MDIFF
19190 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR INDEXING',27X,F10.2)
19200 WRITE (6,19210) NTSST
19210 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR NUMBERING AND FILING
     1',16X,F10.2)
19220 WRITE (6,19230) N21A
19230 FORMAT (/,20X,'EXISTING STAFF TIME FOR NUMBERING AND FILING',22X,
     1F10.2)
19240 WRITE (6,19250) NDIFF
19250 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR NUMBERING AND FILING
     1',15X,F10.2)
19260 WRITE (6,19270) OTSST
19270 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR RETRIEVAL AND CONTRO
     1L',15X,F10.2)
19280 WRITE (6,19290) O9A
19290 FORMAT (/,20X,'EXISTING STAFF TIME FOR RETRIEVAL AND CONTROL',21X,
     1F10.2)
19300 WRITE (6,19310) ODIFF
19310 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR RETRIEVAL AND CONTRO
     1L',14X,F10.2)
19320 WRITE (6,19330) PTSST
19330 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR REPORTS AND CERTIFIC
     1ATES',12X,F10.2)
19340 WRITE (6,19350) P22A
19350 FORMAT (/,20X,'EXISTING STAFF TIME FOR REPORTS AND CERTIFICATES',
     118X,F10.2)
19360 WRITE (6,19370) PDIFF
19370 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR REPORTS AND CERTIFIC
     1ATES',11X,F10.2)
19380 WRITE (6,19390) QTSST
19390 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR PHONE CALLS',25X,
     1F10.2)
19400 WRITE (6,19410) Q9A
19410 FORMAT (/,20X,'EXISTING STAFF TIME FOR PHONE CALLS',31X,F10.2)
19420 WRITE (6,19430) QDIFF
```

```
19430 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR PHONE CALLS',24X,
     1F10.2)
19440 WRITE (6,19450) RTSST
19450 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR CORR./IN-PER. INFO.
     1REQ.',12X,F10.2)
19460 WRITE (6,19470) R22A
19470 FORMAT (/,20X,'EXISTING STAFF TIME FOR CORR./IN-PER. INFO. REQ.',
     118X,F10.2)
19480 WRITE (6,19490) RDIFF
19490 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR CORR./IN-PER. INFO.
     1REQ.',11X,F10.2)
19500 WRITE (6,19510) STSST
19510 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR OUT-PATIENT RECORDS'
     1,17X,F10.2)
19520 WRITE (6,19530) S8A
19530 FORMAT (/,20X,'EXISTING STAFF TIME FOR OUT-PATIENT RECORDS',23X,
     1F10.2)
19540 WRITE (6,19550) SDIFF
19550 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR OUT-PATIENT RECORDS'
     1,16X,F10.2)
19560 WRITE (6,19570) TTSST
19570 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME FOR EMERGENCY ROOM RECOR
     1DS',14X,F10.2)
19580 WRITE (6,19590) T7A
19590 FORMAT (/,20X,'EXISTING STAFF TIME FOR EMERGENCY ROOM RECORDS',20X
     1,F10.2)
19600 WRITE (6,19610) TDIFF
19610 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR EMERGENCY ROOM RECOR
     1DS',13X,F10.2)
19620 IF (OR3) 19730,19730,19630
19630 WRITE (6,19640)
19640 FORMAT (1H1,//,45X,'TOTAL MEDICAL RECORDS STAFFING')
19650 WRITE (6,19660)
19660 FORMAT (//,81X,'MAN HOURS PER WEEK')
19670 WRITE (6,19680) TOTSST
```

```
19680 FORMAT (//,20X,'TOTAL STANDARD STAFF TIME',41X,F10.2)
19690 WRITE (6,19700) TO1A
19700 FORMAT (/,20X,'TOTAL EXISTING STAFF TIME',41X,F10.2)
19710 WRITE (6,19720) TODIFF
19720 FORMAT (/,20X,'EXISTING - STD. STAFF TIME FOR TOTALS',29X,F10.2)
19730 STOP
19740 END
```

END OF COMPILATION: NO DIAGNOSTICS.

APPENDIX B

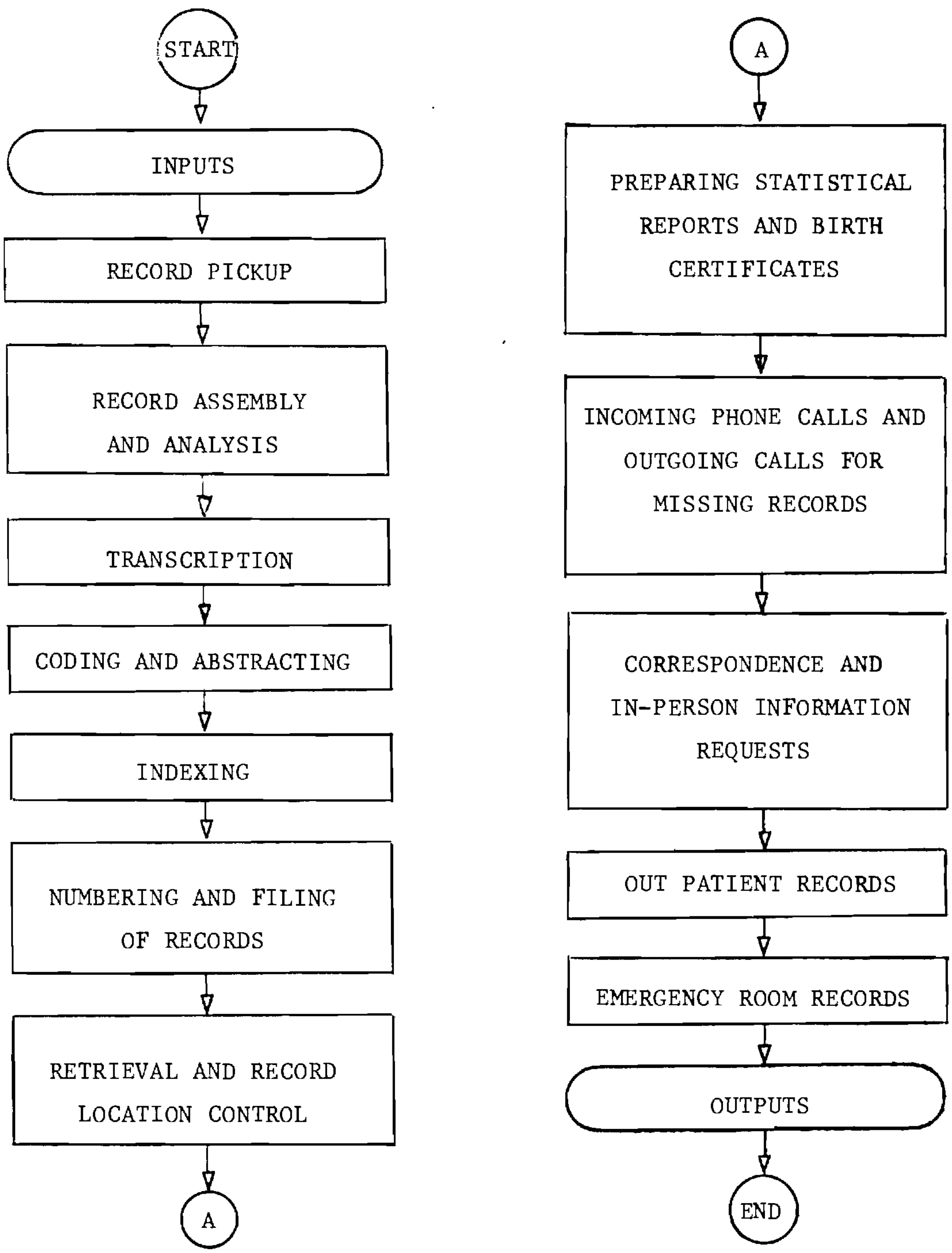
SECTION 3

STAFFING METHOD SUMMARY FLOW DIAGRAM

APPENDIX B

SECTION 3

STAFFING METHOD SUMMARY FLOW DIAGRAM



APPENDIX B

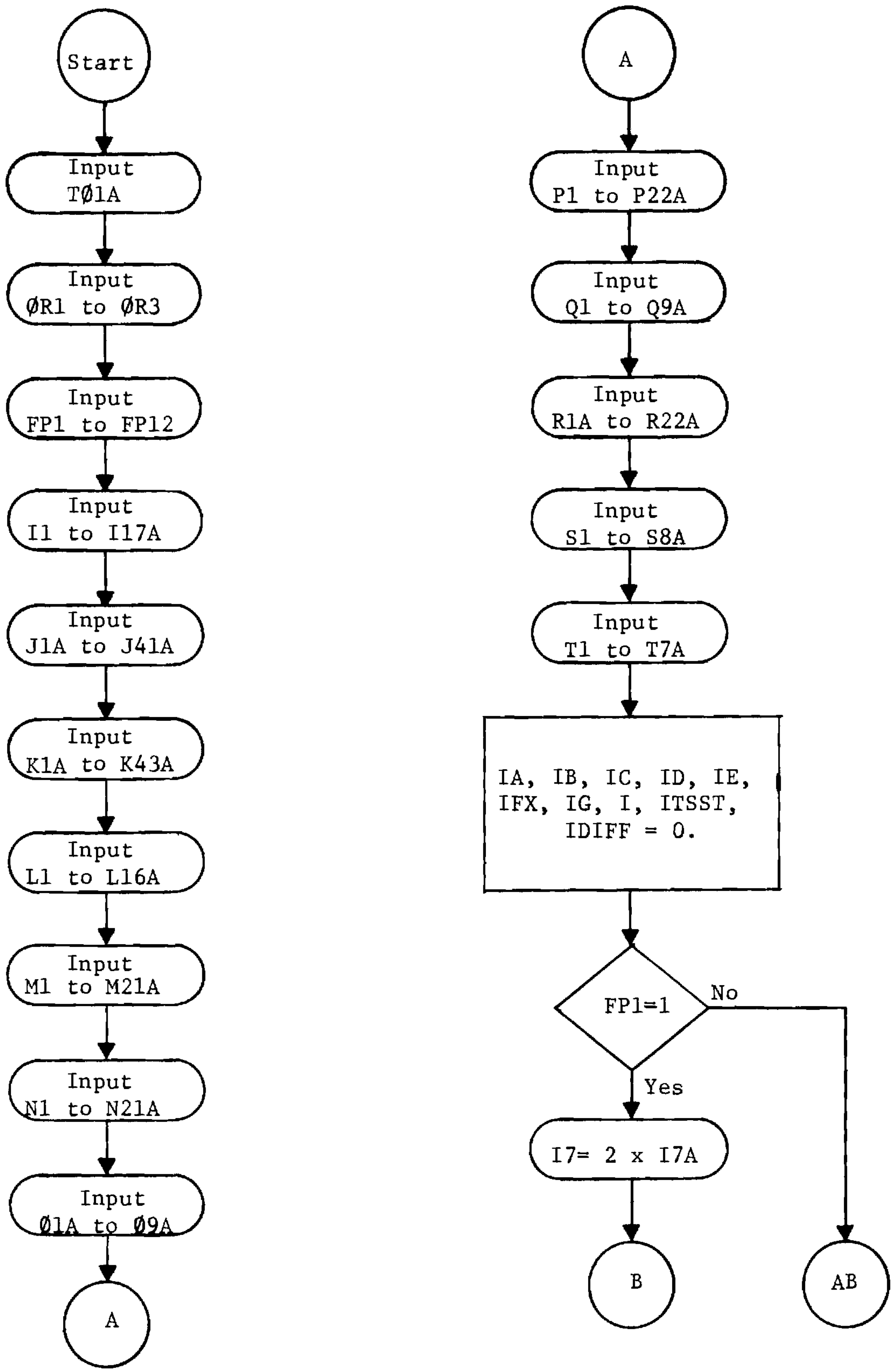
SECTION 4

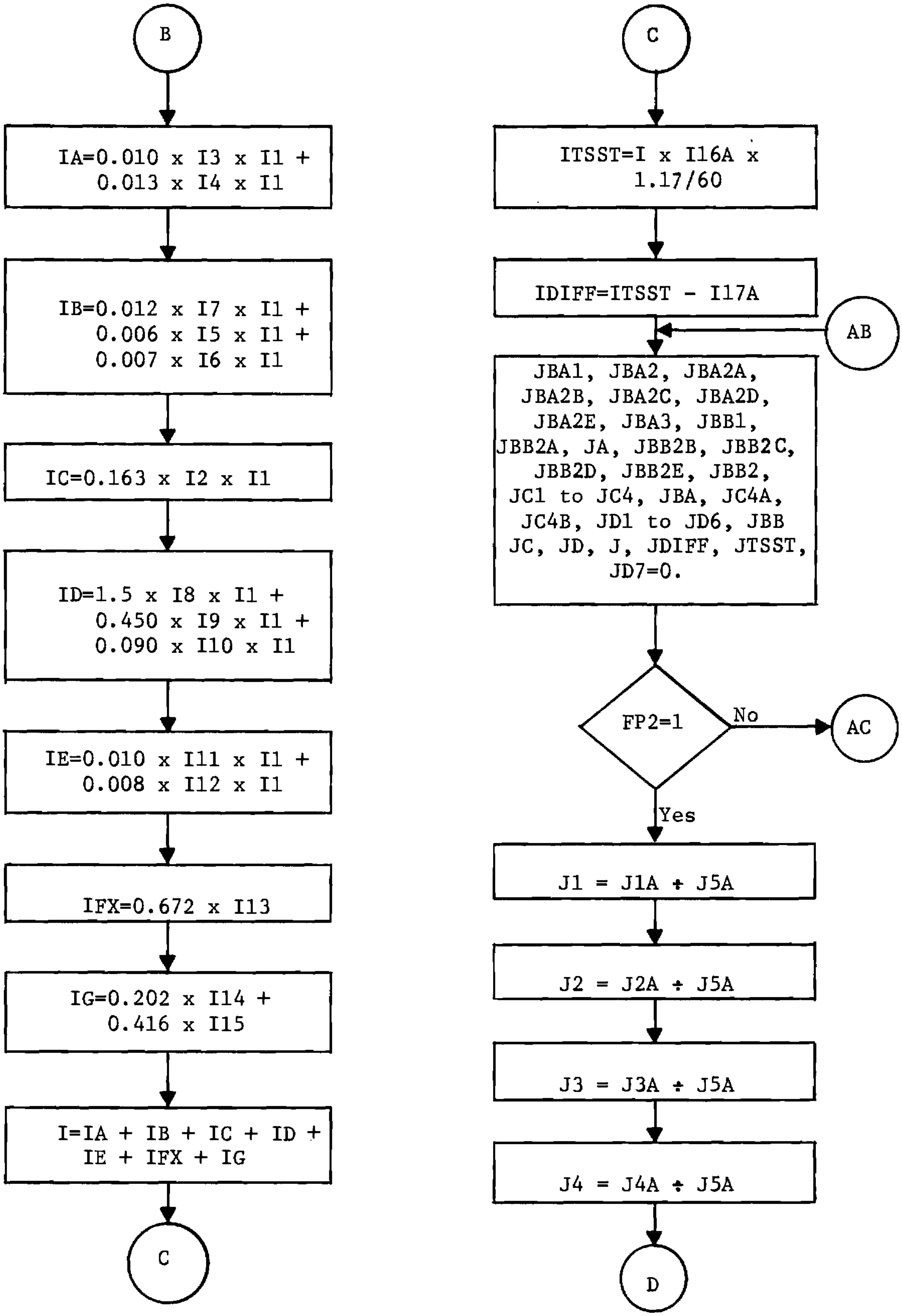
STAFFING METHOD FLOW DIAGRAM

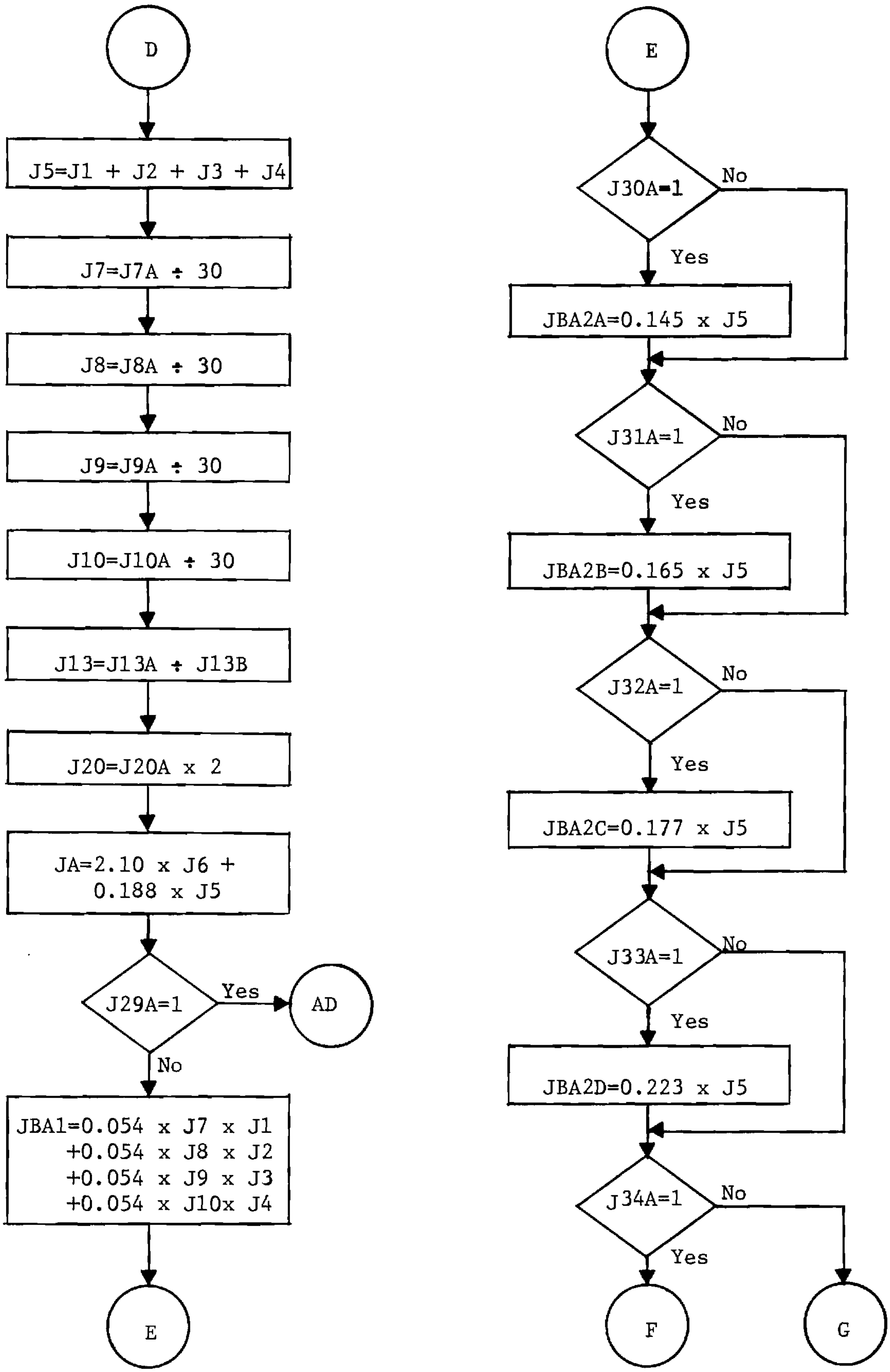
APPENDIX B

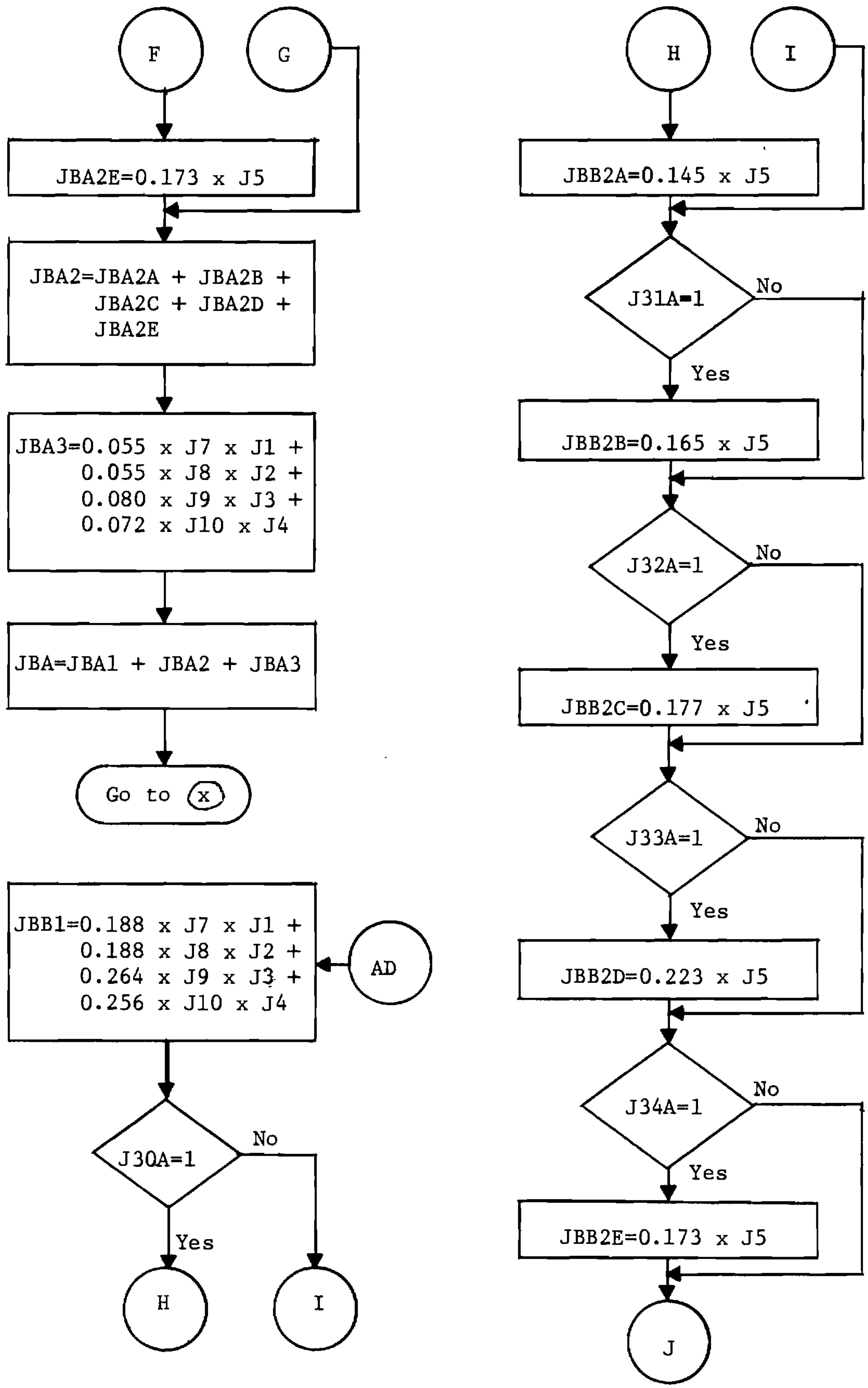
SECTION 4

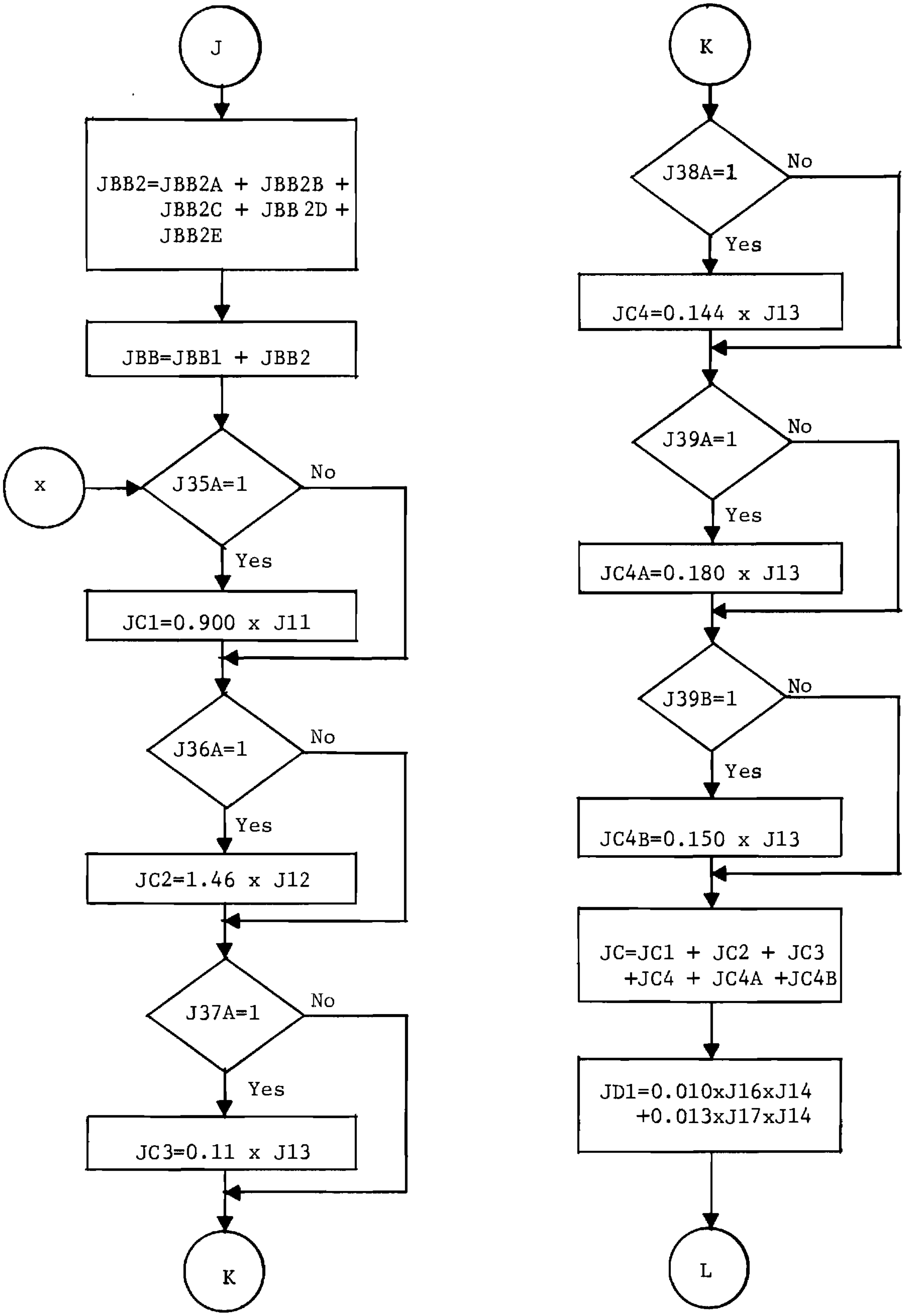
STAFFING METHOD FLOW DIAGRAM



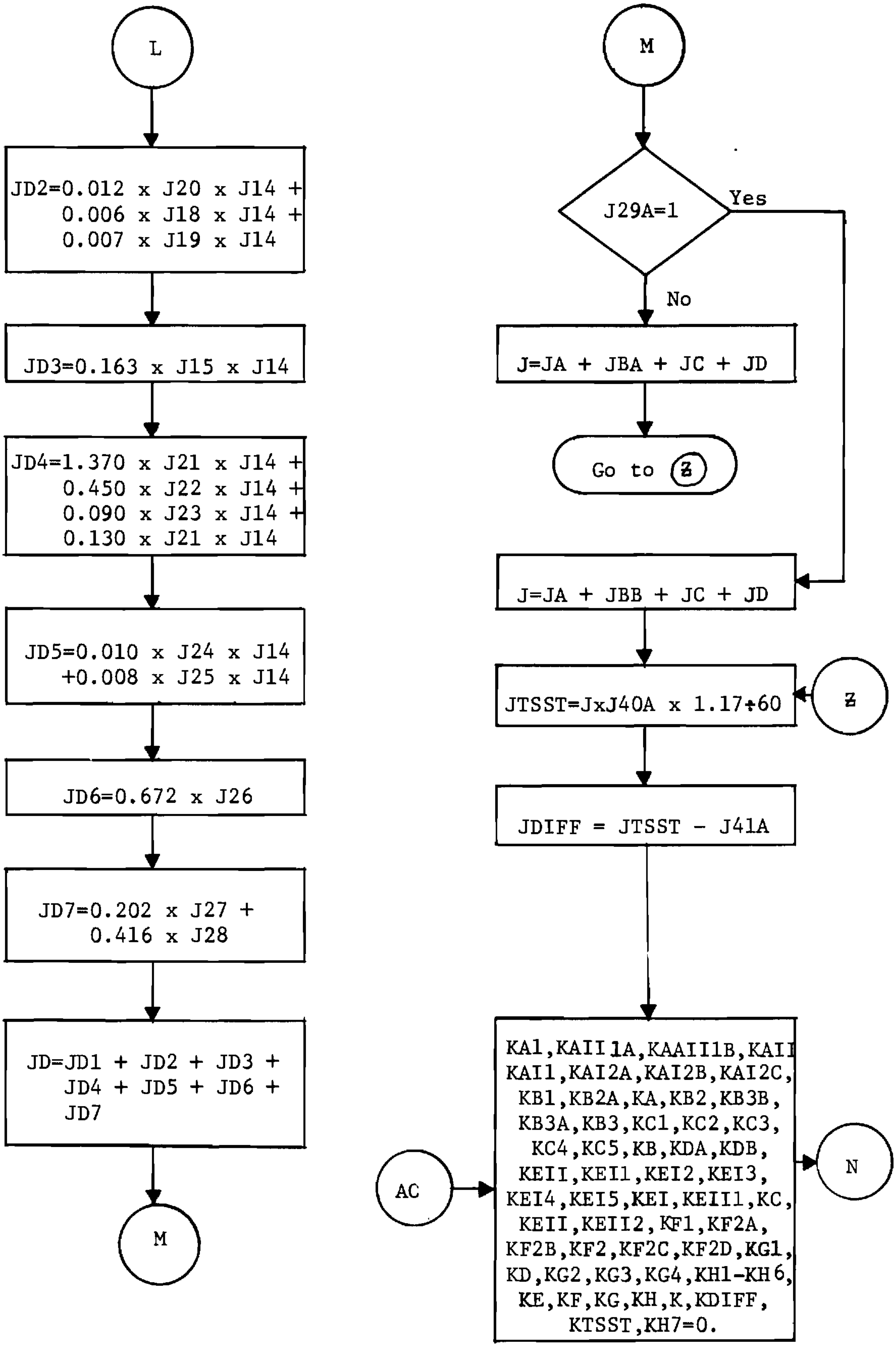

B
IA=0.010 x I3 x I1 +
0.013 x I4 x I1
IB=0.012 x I7 x I1 +
0.006 x I5 x I1 +
0.007 x I6 x I1
IC=0.163 x I2 x I1
ID=1.5 x I8 x I1 +
0.450 x I9 x I1 +
0.090 x I10 x I1
IE=0.010 x I11 x I1 +
0.008 x I12 x I1
IFX=0.672 x I13
IG=0.202 x I14 +
0.416 x I15
I=IA + IB + IC + ID +
IE + IFX + IG
C
C
ITSST=I x I16A x
1.17/60
IDIFF=ITSST - I17A
AB
JBA1, JBA2, JBA2A,
JBA2B, JBA2C, JBA2D,
JBA2E, JBA3, JBB1,
JBB2A, JA, JBB2B, JBB2C,
JBB2D, JBB2E, JBB2,
JC1 to JC4, JBA, JC4A,
JC4B, JD1 to JD6, JBB
JC, JD, J, JDIFF, JTSST,
JD7=0.
FP2=1
No
AC
Yes
J1 = J1A ÷ J5A
J2 = J2A ÷ J5A
J3 = J3A ÷ J5A
J4 = J4A ÷ J5A
D

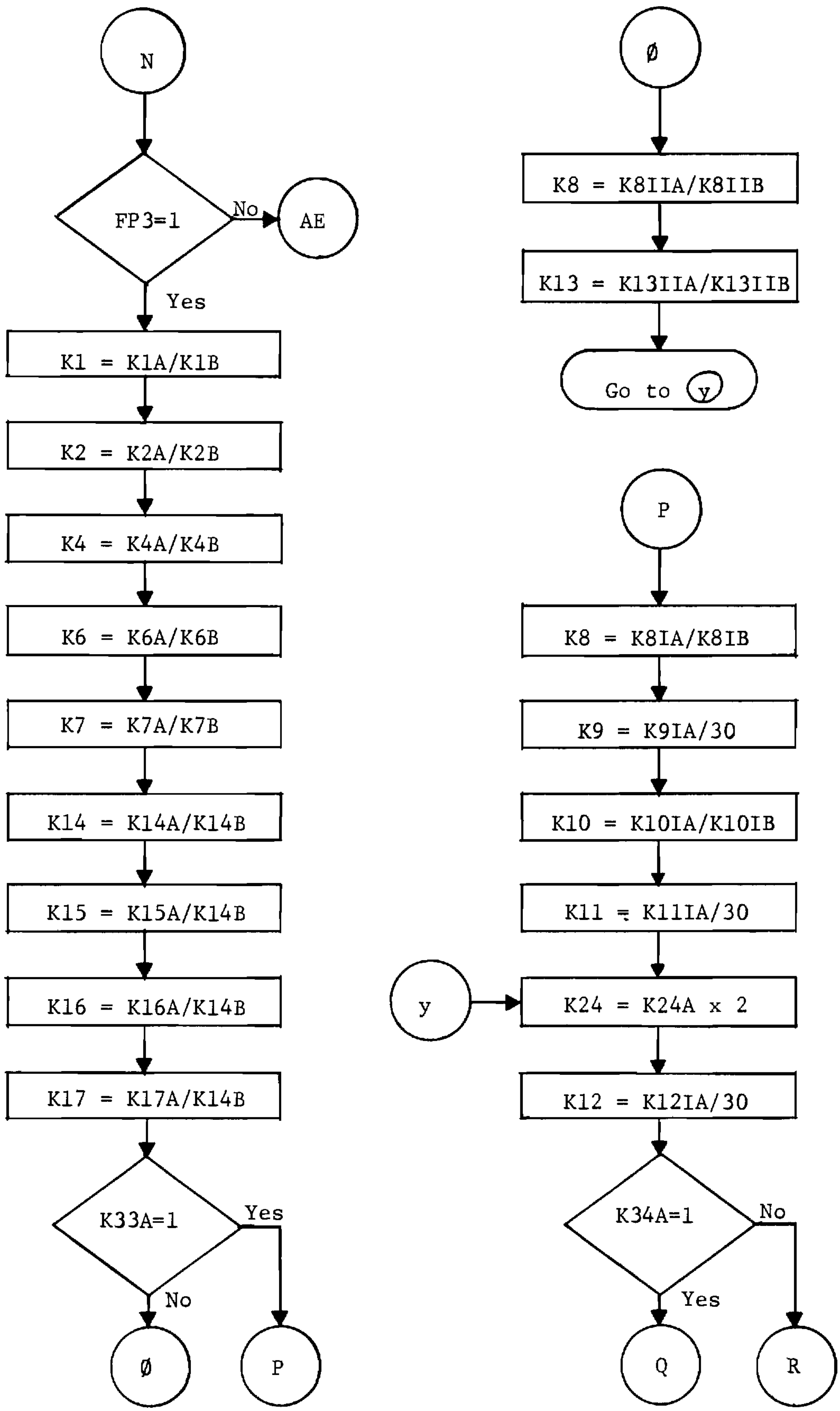

D
J5=J1 + J2 + J3 + J4
J7=J7A ÷ 30
J8=J8A ÷ 30
J9=J9A ÷ 30
J10=J10A ÷ 30
J13=J13A ÷ J13B
J20=J20A x 2
JA=2.10 x J6 + 0.188 x J5
J29A=1
Yes
AD
No
JBA1=0.054 x J7 x J1 +0.054 x J8 x J2 +0.054 x J9 x J3 +0.054 x J10x J4
E
E
J30A=1
No
Yes
JBA2A=0.145 x J5
J31A=1
No
Yes
JBA2B=0.165 x J5
J32A=1
No
Yes
JBA2C=0.177 x J5
J33A=1
No
Yes
JBA2D=0.223 x J5
J34A=1
No
Yes
F
G

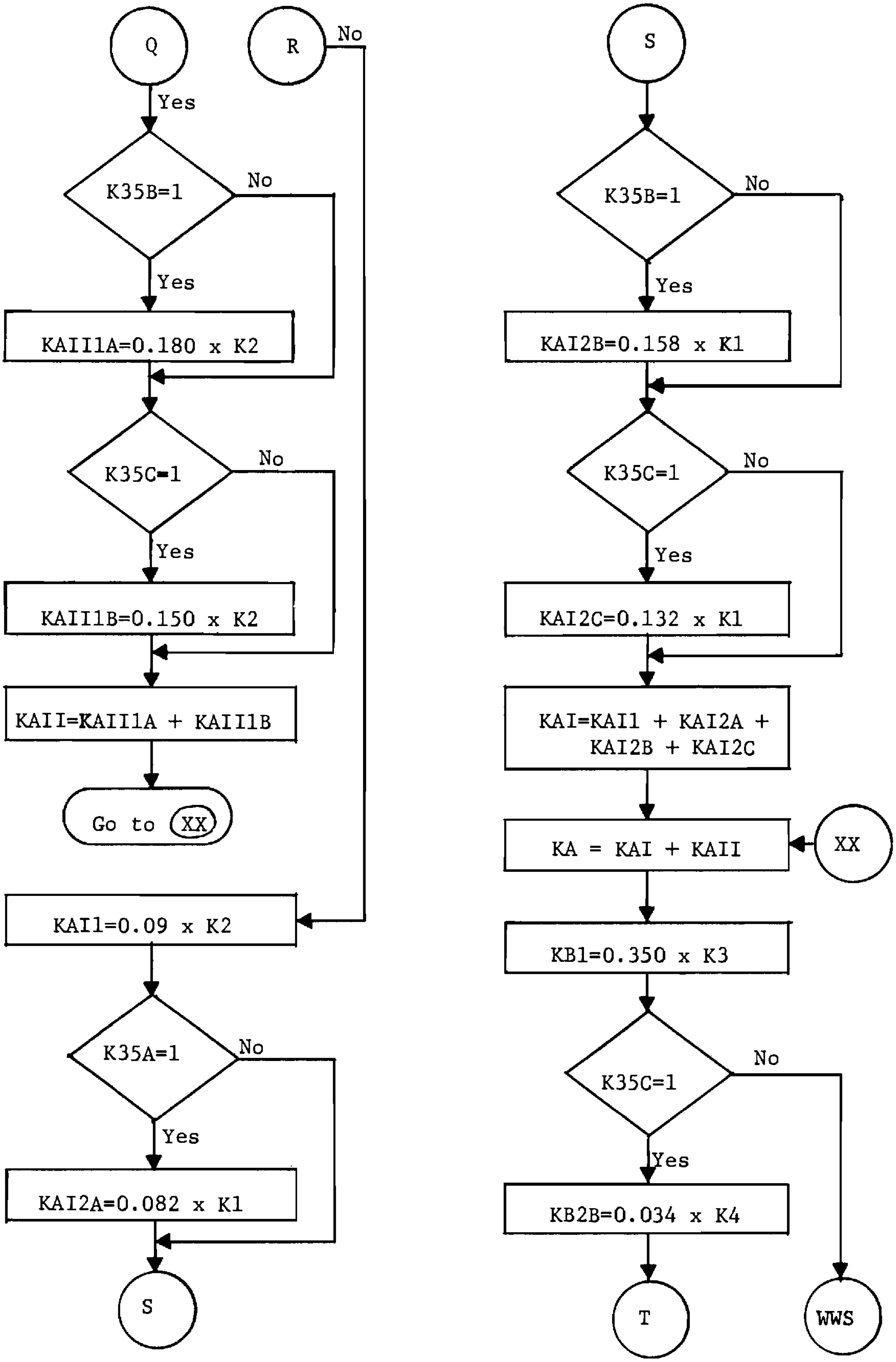

F
G
JBA2E=0.173 x J5
JBA2=JBA2A + JBA2B + JBA2C + JBA2D + JBA2E
JBA3=0.055 x J7 x J1 + 0.055 x J8 x J2 + 0.080 x J9 x J3 + 0.072 x J10 x J4
JBA=JBA1 + JBA2 + JBA3
Go to x
JBB1=0.188 x J7 x J1 + 0.188 x J8 x J2 + 0.264 x J9 x J3 + 0.256 x J10 x J4
AD
J30A=1
No
Yes
H
I
H
I
JBB2A=0.145 x J5
J31A=1
No
Yes
JBB2B=0.165 x J5
J32A=1
No
Yes
JBB2C=0.177 x J5
J33A=1
No
Yes
JBB2D=0.223 x J5
J34A=1
No
Yes
JBB2E=0.173 x J5
J

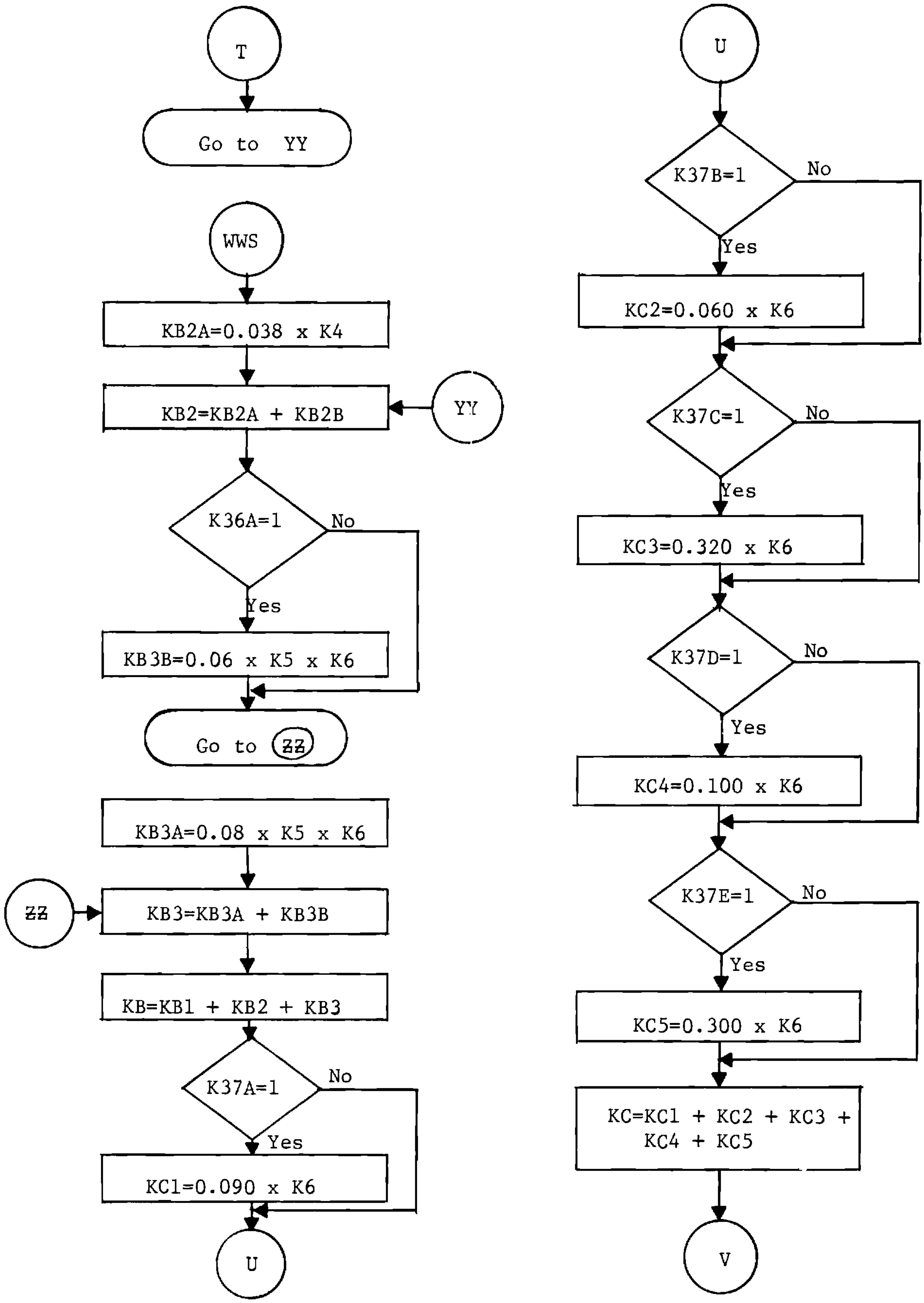


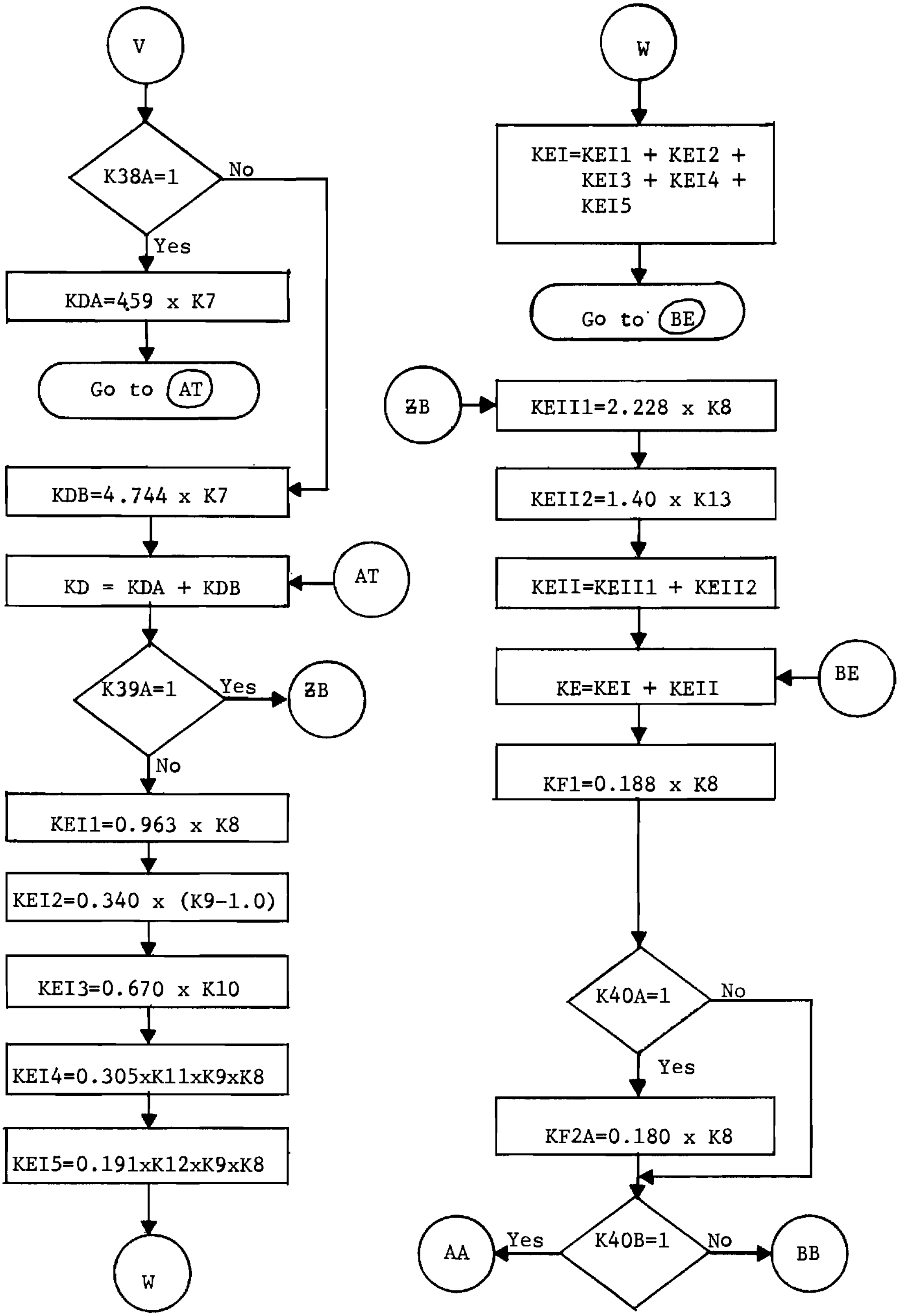
J
JBB2=JBB2A + JBB2B + JBB2C + JBB 2D + JBB2E
JBB=JBB1 + JBB2
x
J35A=1
No
Yes
JC1=0.900 x J11
J36A=1
No
Yes
JC2=1.46 x J12
J37A=1
No
Yes
JC3=0.11 x J13
K
K
J38A=1
No
Yes
JC4=0.144 x J13
J39A=1
No
Yes
JC4A=0.180 x J13
J39B=1
No
Yes
JC4B=0.150 x J13
JC=JC1 + JC2 + JC3 +JC4 + JC4A +JC4B
JD1=0.010xJ16xJ14 +0.013xJ17xJ14
L

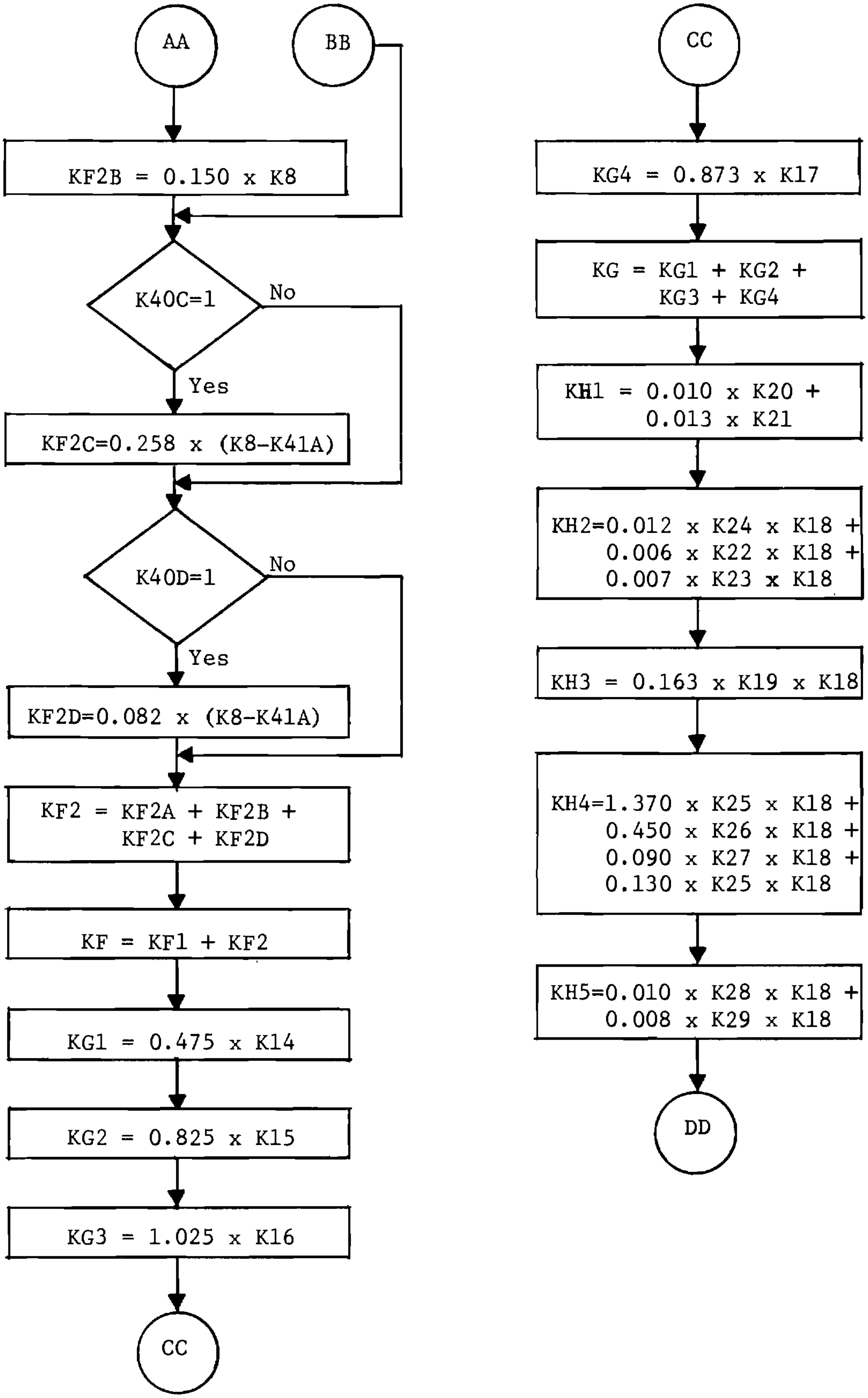

L
JD2=0.012 x J20 x J14 + 0.006 x J18 x J14 + 0.007 x J19 x J14
JD3=0.163 x J15 x J14
JD4=1.370 x J21 x J14 + 0.450 x J22 x J14 + 0.090 x J23 x J14 + 0.130 x J21 x J14
JD5=0.010 x J24 x J14 +0.008 x J25 x J14
JD6=0.672 x J26
JD7=0.202 x J27 + 0.416 x J28
JD=JD1 + JD2 + JD3 + JD4 + JD5 + JD6 + JD7
M
M
J29A=1
Yes
No
J=JA + JBA + JC + JD
Go to Z
J=JA + JBB + JC + JD
JTSST=JxJ40A x 1.17÷60
Z
JDIFF = JTSST - J41A
AC
KA1,KAII1A,KAAII1B,KAII KAI1,KAI2A,KAI2B,KAI2C, KB1,KB2A,KA,KB2,KB3B, KB3A,KB3,KC1,KC2,KC3, KC4,KC5,KB,KDA,KDB, KEII,KEI1,KEI2,KEI3, KEI4,KEI5,KEI,KEII1,KC, KEII,KEII2,KF1,KF2A, KF2B,KF2,KF2C,KF2D,KG1, KD,KG2,KG3,KG4,KH1-KH6, KE,KF,KG,KH,K,KDIFF, KTSST,KH7=0.
N

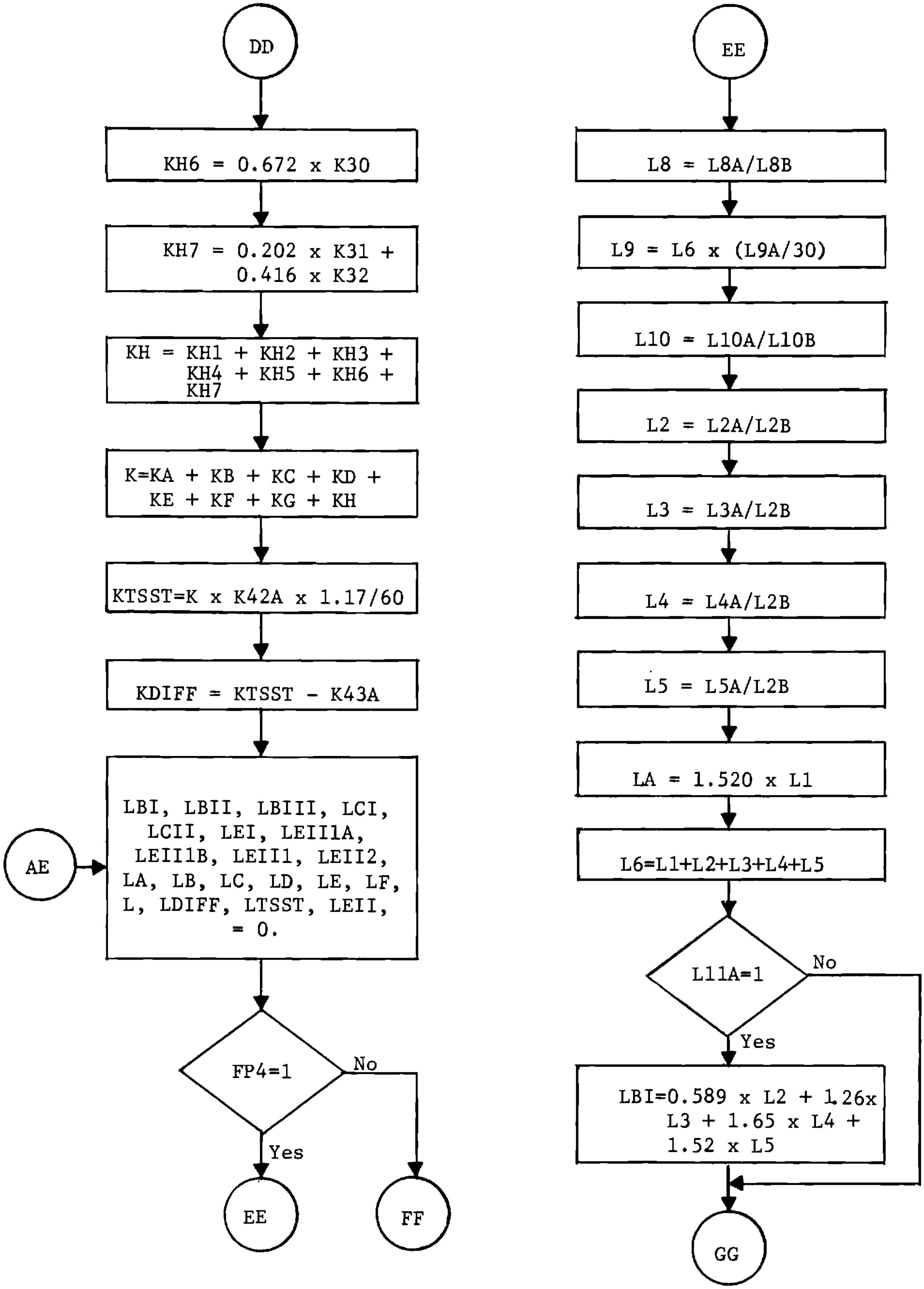

N
FP3=1
No
AE
Yes
K1 = K1A/K1B
K2 = K2A/K2B
K4 = K4A/K4B
K6 = K6A/K6B
K7 = K7A/K7B
K14 = K14A/K14B
K15 = K15A/K14B
K16 = K16A/K14B
K17 = K17A/K14B
K33A=1
Yes
No
Ø
P
Ø
K8 = K8IIA/K8IIB
K13 = K13IIA/K13IIB
Go to y
P
K8 = K8IA/K8IB
K9 = K9IA/30
K10 = K10IA/K10IB
K11 = K11IA/30
y
K24 = K24A x 2
K12 = K12IA/30
K34A=1
No
Yes
Q
R

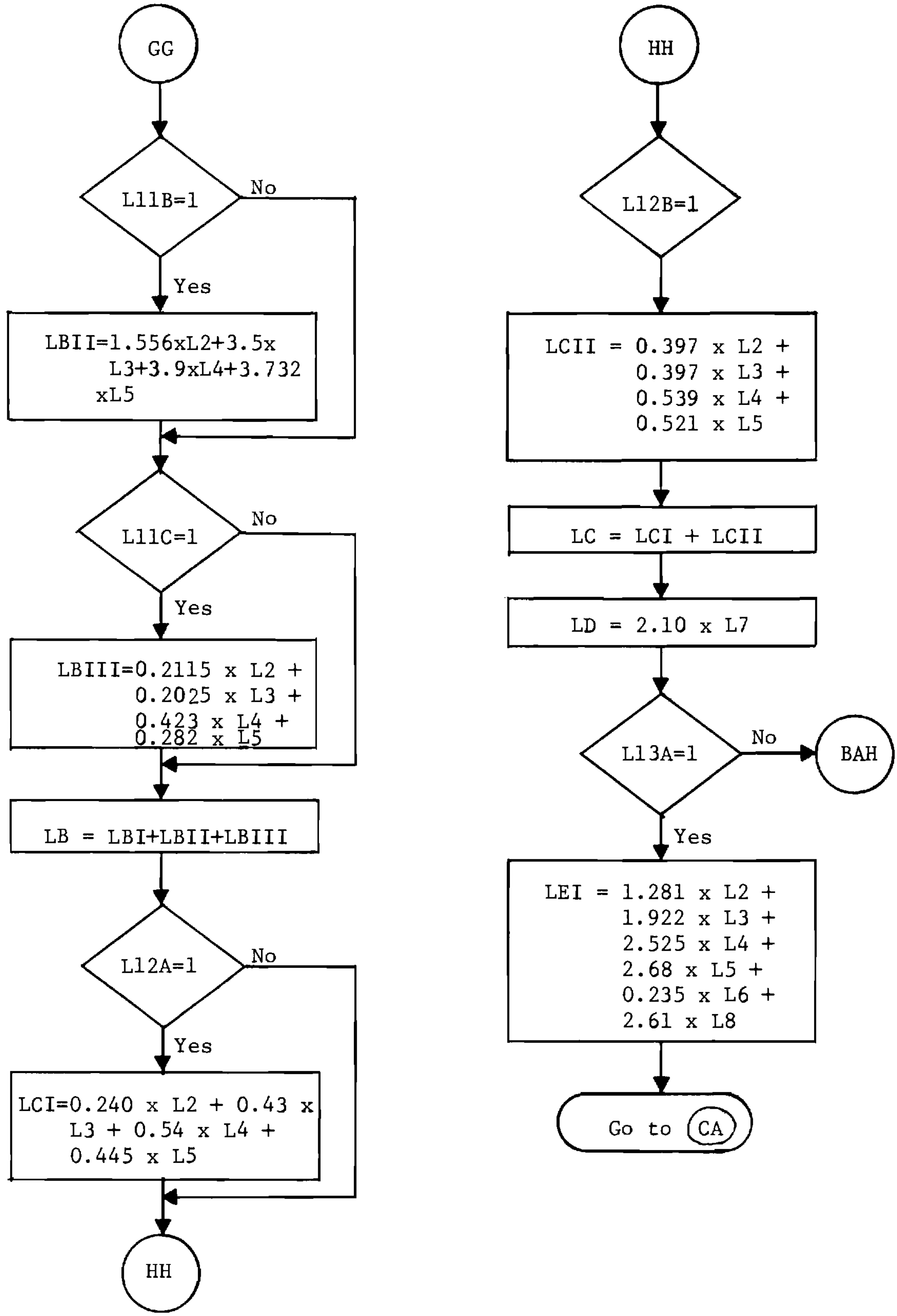

Q
R
No
Yes
K35B=1
No
Yes
KAII1A=0.180 x K2
K35C=1
No
Yes
KAII1B=0.150 x K2
KAII=KAII1A + KAII1B
Go to XX
KAI1=0.09 x K2
K35A=1
No
Yes
KAI2A=0.082 x K1
S
S
K35B=1
No
Yes
KAI2B=0.158 x K1
K35C=1
No
Yes
KAI2C=0.132 x K1
KAI=KAI1 + KAI2A + KAI2B + KAI2C
KA = KAI + KAII
XX
KB1=0.350 x K3
K35C=1
No
Yes
KB2B=0.034 x K4
T
WWS

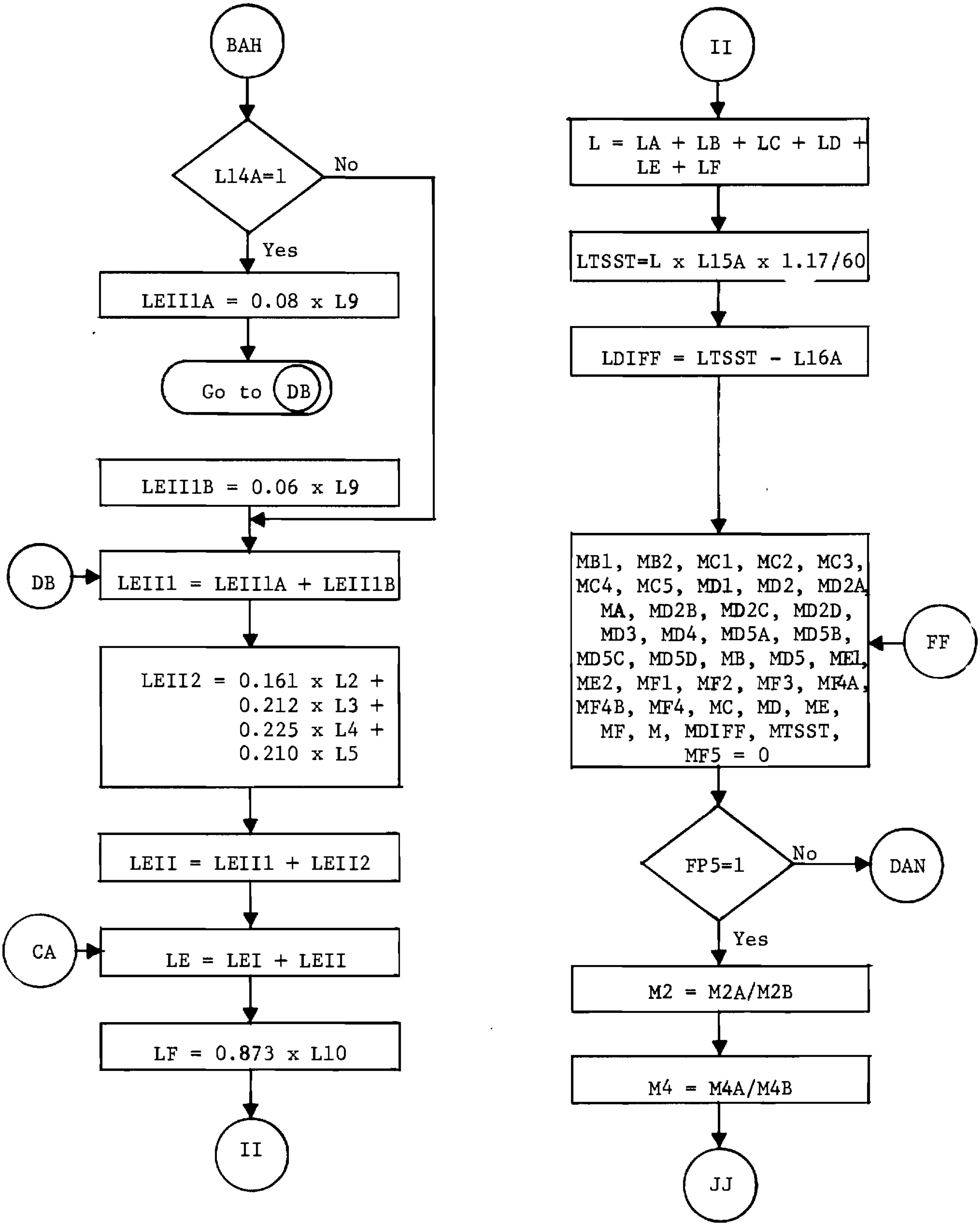

T
Go to YY
WWS
KB2A=0.038 x K4
KB2=KB2A + KB2B
YY
K36A=1
No
Yes
KB3B=0.06 x K5 x K6
Go to ZZ
KB3A=0.08 x K5 x K6
ZZ
KB3=KB3A + KB3B
KB=KB1 + KB2 + KB3
K37A=1
No
Yes
KC1=0.090 x K6
U
U
K37B=1
No
Yes
KC2=0.060 x K6
K37C=1
No
Yes
KC3=0.320 x K6
K37D=1
No
Yes
KC4=0.100 x K6
K37E=1
No
Yes
KC5=0.300 x K6
KC=KC1 + KC2 + KC3 + KC4 + KC5
V

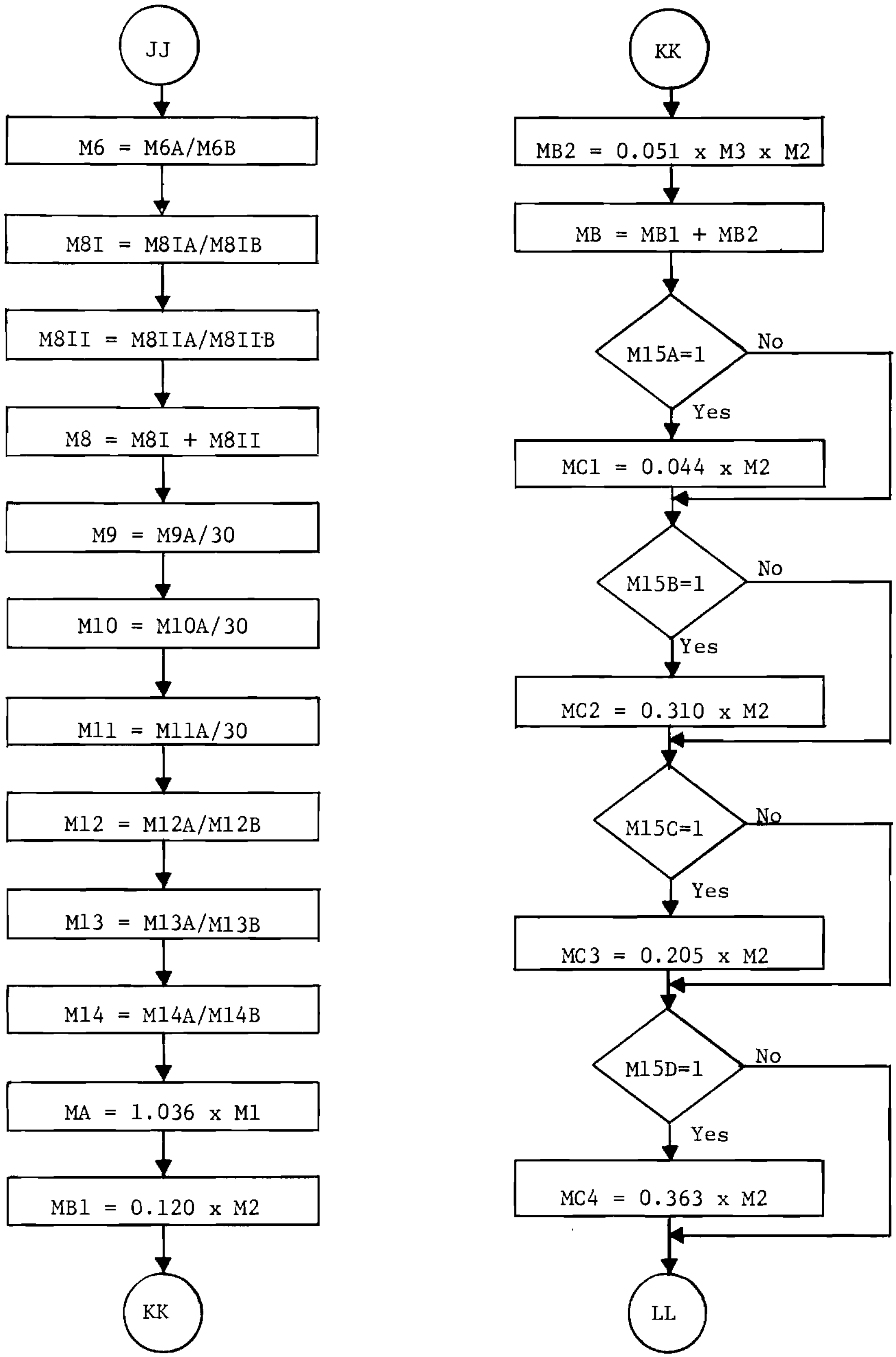

V
K38A=1
No
Yes
KDA=459 x K7
Go to AT
KDB=4.744 x K7
KD = KDA + KDB
AT
K39A=1
Yes
ZB
No
KEI1=0.963 x K8
KEI2=0.340 x (K9-1.0)
KEI3=0.670 x K10
KEI4=0.305xK11xK9xK8
KEI5=0.191xK12xK9xK8
W
W
KEI=KEI1 + KEI2 + KEI3 + KEI4 + KEI5
Go to BE
ZB
KEII1=2.228 x K8
KEII2=1.40 x K13
KEII=KEII1 + KEII2
KE=KEI + KEII
BE
KF1=0.188 x K8
K40A=1
No
Yes
KF2A=0.180 x K8
AA
Yes
K40B=1
No
BB

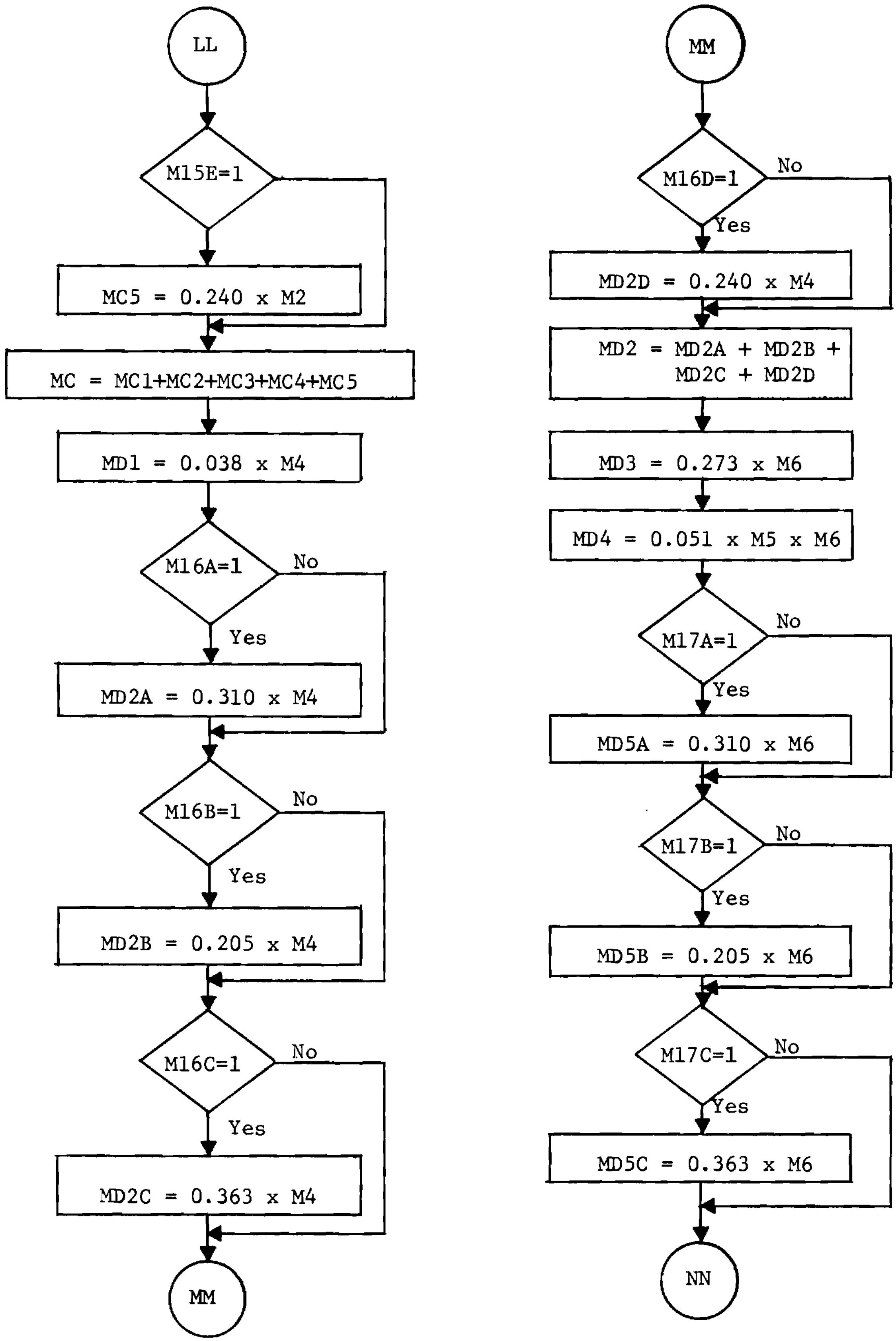

AA
BB
KF2B = 0.150 x K8
K40C=1
No
Yes
KF2C=0.258 x (K8-K41A)
K40D=1
No
Yes
KF2D=0.082 x (K8-K41A)
KF2 = KF2A + KF2B +
KF2C + KF2D
KF = KF1 + KF2
KG1 = 0.475 x K14
KG2 = 0.825 x K15
KG3 = 1.025 x K16
CC
CC
KG4 = 0.873 x K17
KG = KG1 + KG2 +
KG3 + KG4
KH1 = 0.010 x K20 +
0.013 x K21
KH2=0.012 x K24 x K18 +
0.006 x K22 x K18 +
0.007 x K23 x K18
KH3 = 0.163 x K19 x K18
KH4=1.370 x K25 x K18 +
0.450 x K26 x K18 +
0.090 x K27 x K18 +
0.130 x K25 x K18
KH5=0.010 x K28 x K18 +
0.008 x K29 x K18
DD

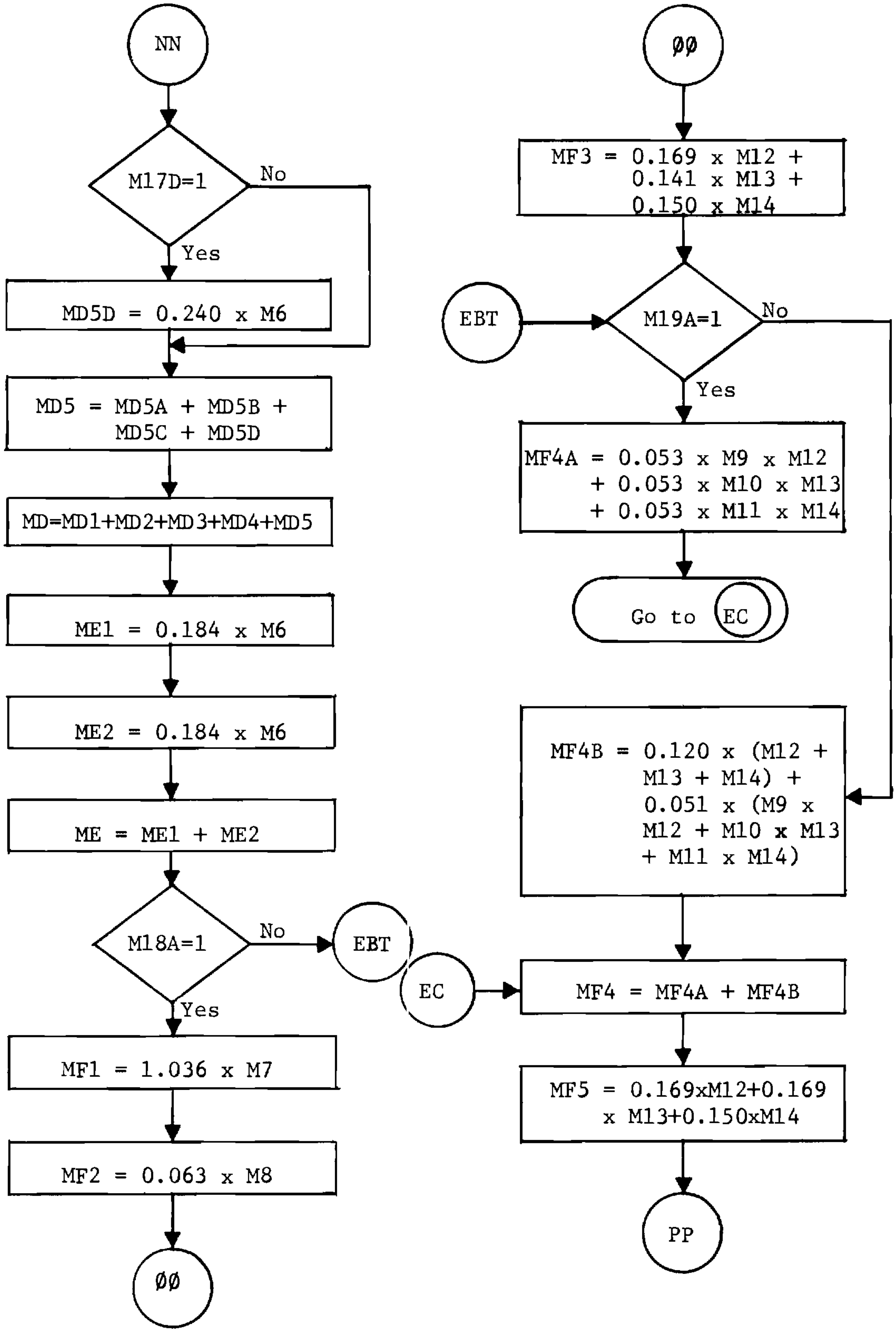

DD
KH6 = 0.672 x K30
KH7 = 0.202 x K31 + 0.416 x K32
KH = KH1 + KH2 + KH3 + KH4 + KH5 + KH6 + KH7
K=KA + KB + KC + KD + KE + KF + KG + KH
KTSST=K x K42A x 1.17/60
KDIFF = KTSST - K43A
AE
LBI, LBII, LBIII, LCI, LCII, LEI, LEIIIA, LEII1B, LEII1, LEII2, LA, LB, LC, LD, LE, LF, L, LDIFF, LTSST, LEII, = 0.
FP4=1
No
Yes
EE
FF
EE
L8 = L8A/L8B
L9 = L6 x (L9A/30)
L10 = L10A/L10B
L2 = L2A/L2B
L3 = L3A/L2B
L4 = L4A/L2B
L5 = L5A/L2B
LA = 1.520 x L1
L6=L1+L2+L3+L4+L5
L11A=1
No
Yes
LBI=0.589 x L2 + 1.26x L3 + 1.65 x L4 + 1.52 x L5
GG

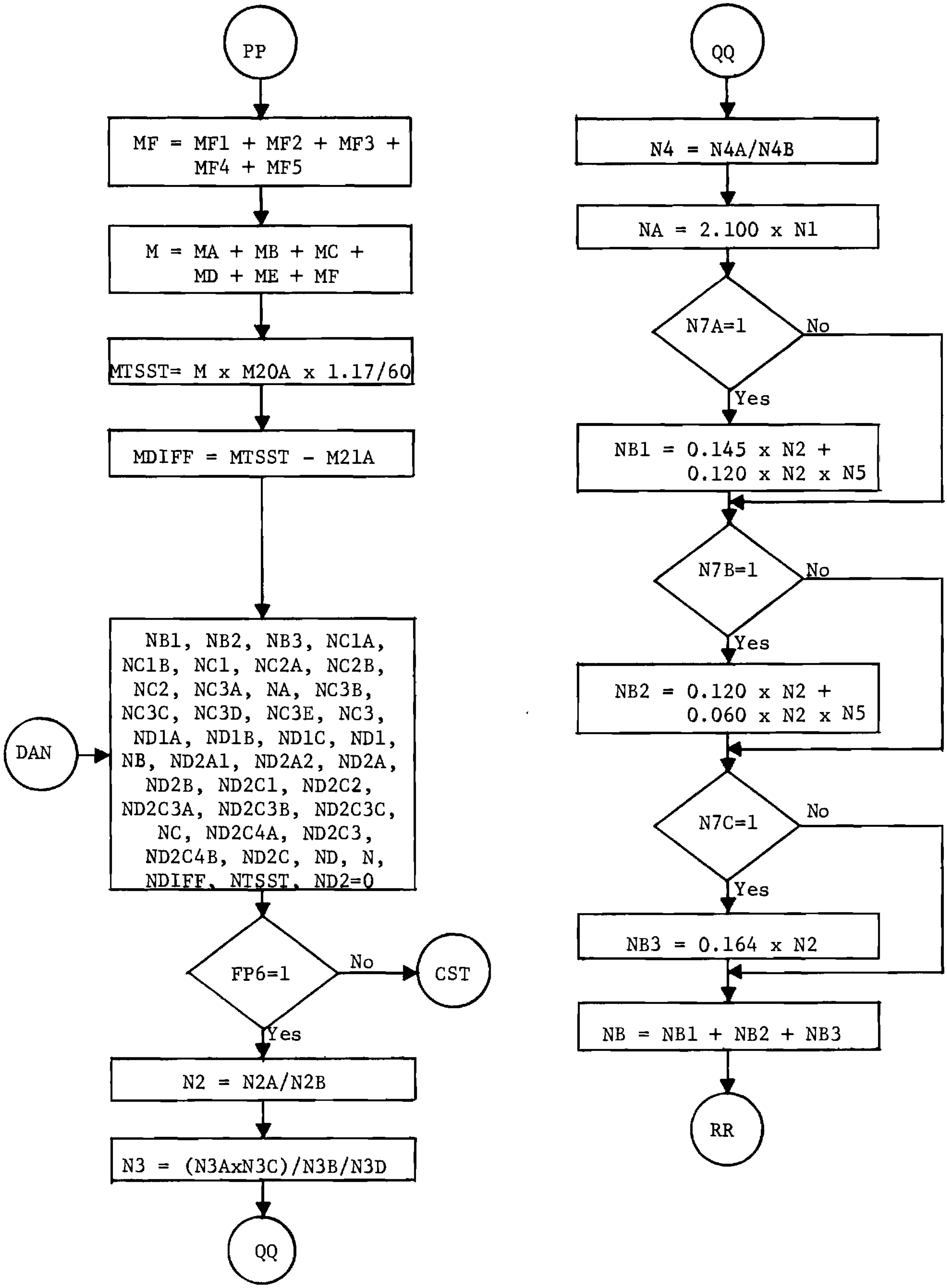

GG
L11B=1
No
Yes
LBII=1.556xL2+3.5x L3+3.9xL4+3.732 xL5
L11C=1
No
Yes
LBIII=0.2115 x L2 + 0.2025 x L3 + 0.423 x L4 + 0.282 x L5
LB = LBI+LBII+LBIII
L12A=1
No
Yes
LCI=0.240 x L2 + 0.43 x L3 + 0.54 x L4 + 0.445 x L5
HH
HH
L12B=1
LCII = 0.397 x L2 + 0.397 x L3 + 0.539 x L4 + 0.521 x L5
LC = LCI + LCII
LD = 2.10 x L7
L13A=1
No
BAH
Yes
LEI = 1.281 x L2 + 1.922 x L3 + 2.525 x L4 + 2.68 x L5 + 0.235 x L6 + 2.61 x L8
Go to CA

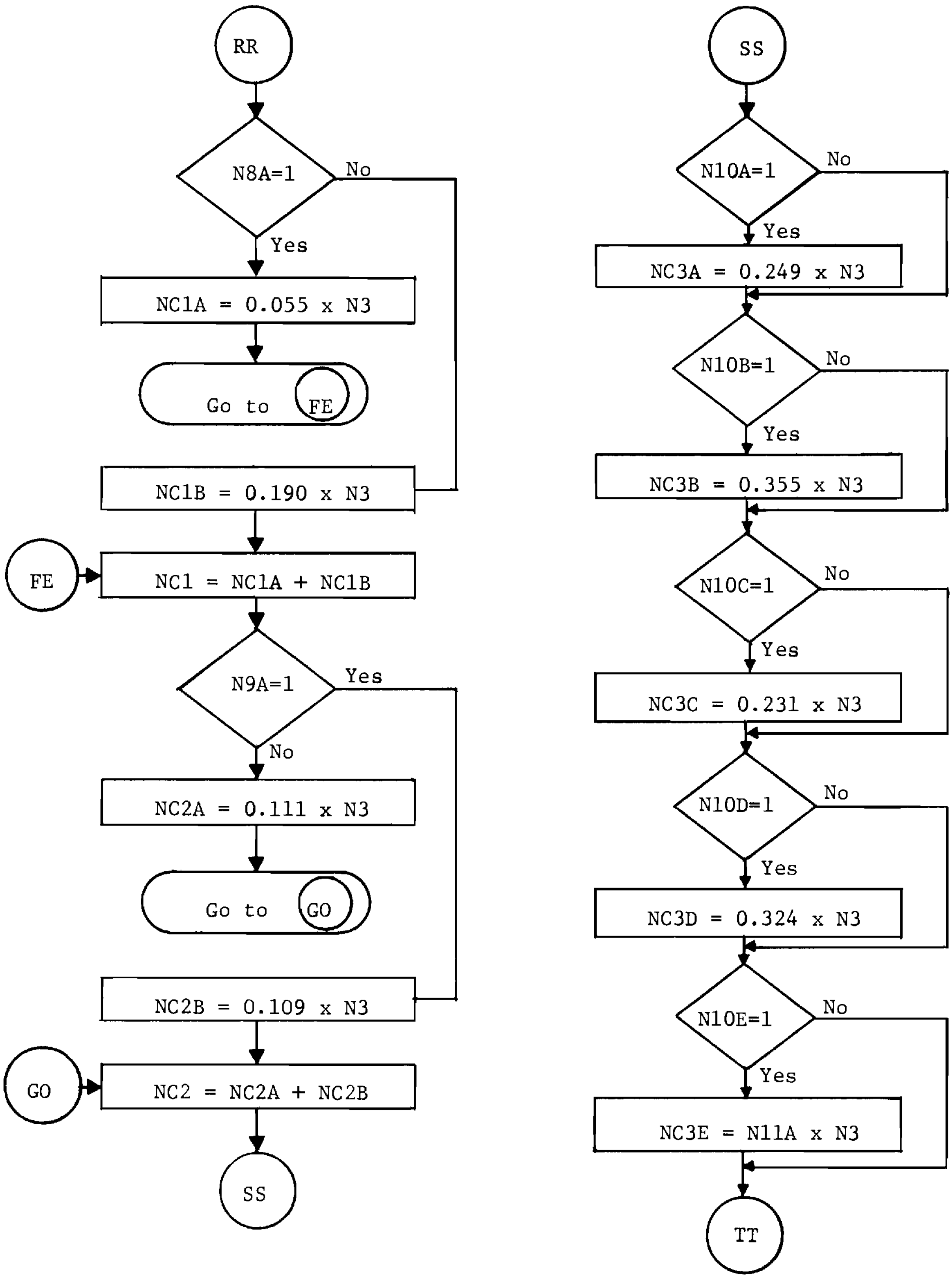

BAH
L14A=1
No
Yes
LEII1A = 0.08 x L9
Go to DB
LEII1B = 0.06 x L9
DB
LEII1 = LEII1A + LEII1B
LEII2 = 0.161 x L2 + 0.212 x L3 + 0.225 x L4 + 0.210 x L5
LEII = LEII1 + LEII2
CA
LE = LEI + LEII
LF = 0.873 x L10
II
II
L = LA + LB + LC + LD + LE + LF
LTSST=L x L15A x 1.17/60
LDIFF = LTSST - L16A
MB1, MB2, MC1, MC2, MC3, MC4, MC5, MD1, MD2, MD2A, MA, MD2B, MD2C, MD2D, MD3, MD4, MD5A, MD5B, MD5C, MD5D, MB, MD5, ME1, ME2, MF1, MF2, MF3, MF4A, MF4B, MF4, MC, MD, ME, MF, M, MDIFF, MTSST, MF5 = 0
FF
FP5=1
No
DAN
Yes
M2 = M2A/M2B
M4 = M4A/M4B
JJ

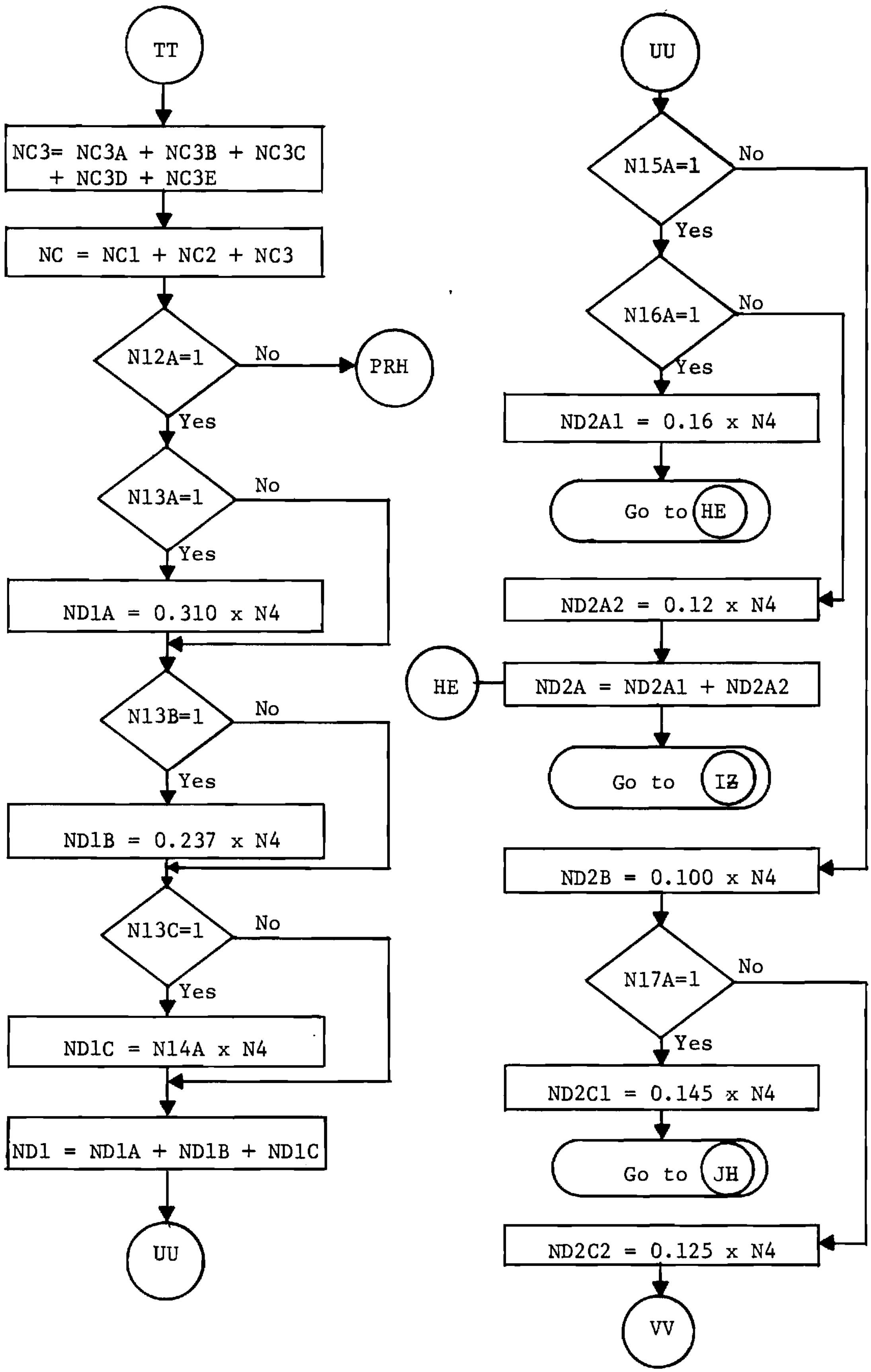

JJ
M6 = M6A/M6B
M8I = M8IA/M8IB
M8II = M8IIA/M8IIB
M8 = M8I + M8II
M9 = M9A/30
M10 = M10A/30
M11 = M11A/30
M12 = M12A/M12B
M13 = M13A/M13B
M14 = M14A/M14B
MA = 1.036 x M1
MB1 = 0.120 x M2
KK
KK
MB2 = 0.051 x M3 x M2
MB = MB1 + MB2
M15A=1
No
Yes
MC1 = 0.044 x M2
M15B=1
No
Yes
MC2 = 0.310 x M2
M15C=1
No
Yes
MC3 = 0.205 x M2
M15D=1
No
Yes
MC4 = 0.363 x M2
LL

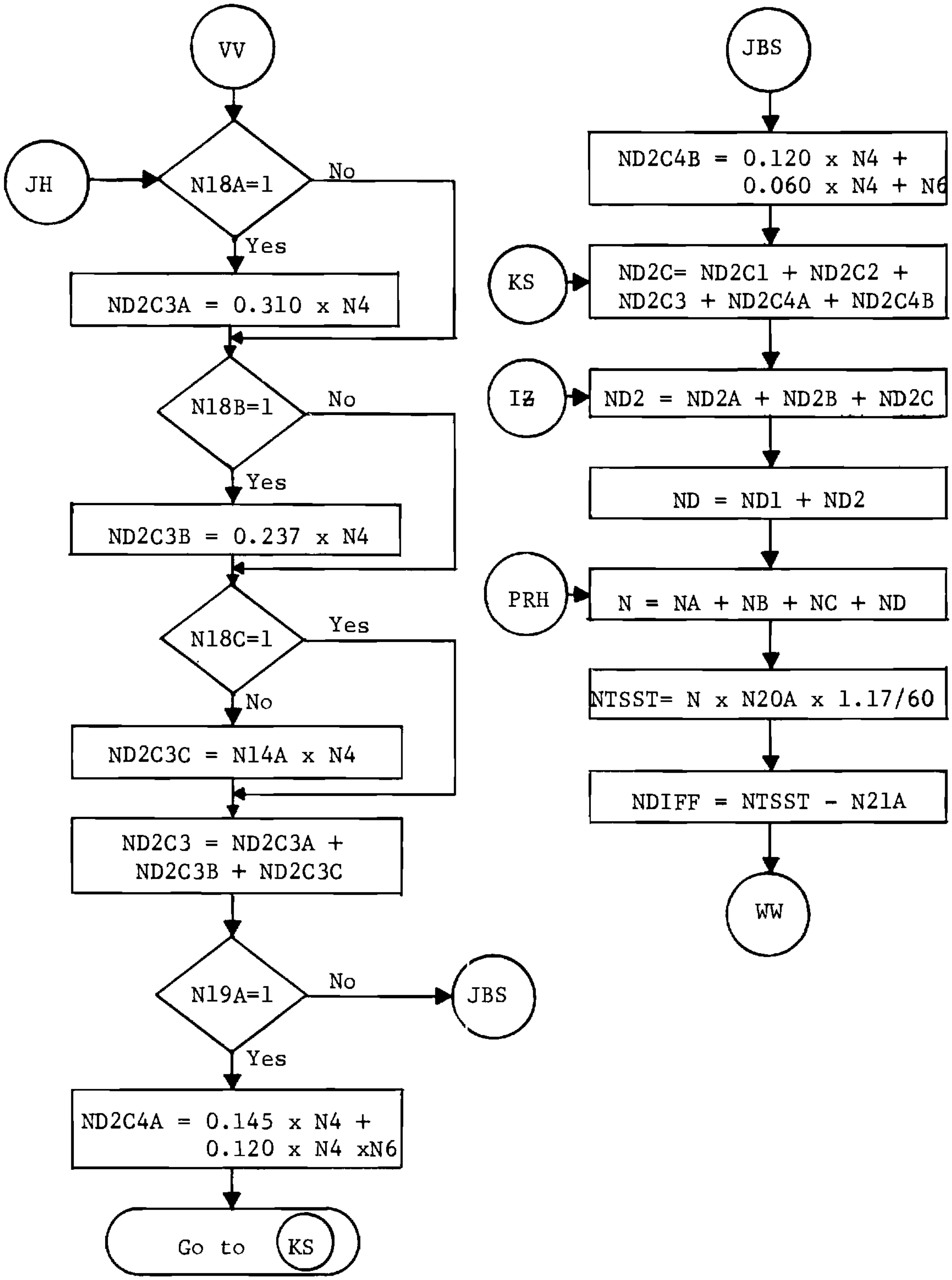

LL
M15E=1
MC5 = 0.240 x M2
MC = MC1+MC2+MC3+MC4+MC5
MD1 = 0.038 x M4
M16A=1
No
Yes
MD2A = 0.310 x M4
M16B=1
No
Yes
MD2B = 0.205 x M4
M16C=1
No
Yes
MD2C = 0.363 x M4
MM
MM
M16D=1
No
Yes
MD2D = 0.240 x M4
MD2 = MD2A + MD2B + MD2C + MD2D
MD3 = 0.273 x M6
MD4 = 0.051 x M5 x M6
M17A=1
No
Yes
MD5A = 0.310 x M6
M17B=1
No
Yes
MD5B = 0.205 x M6
M17C=1
No
Yes
MD5C = 0.363 x M6
NN

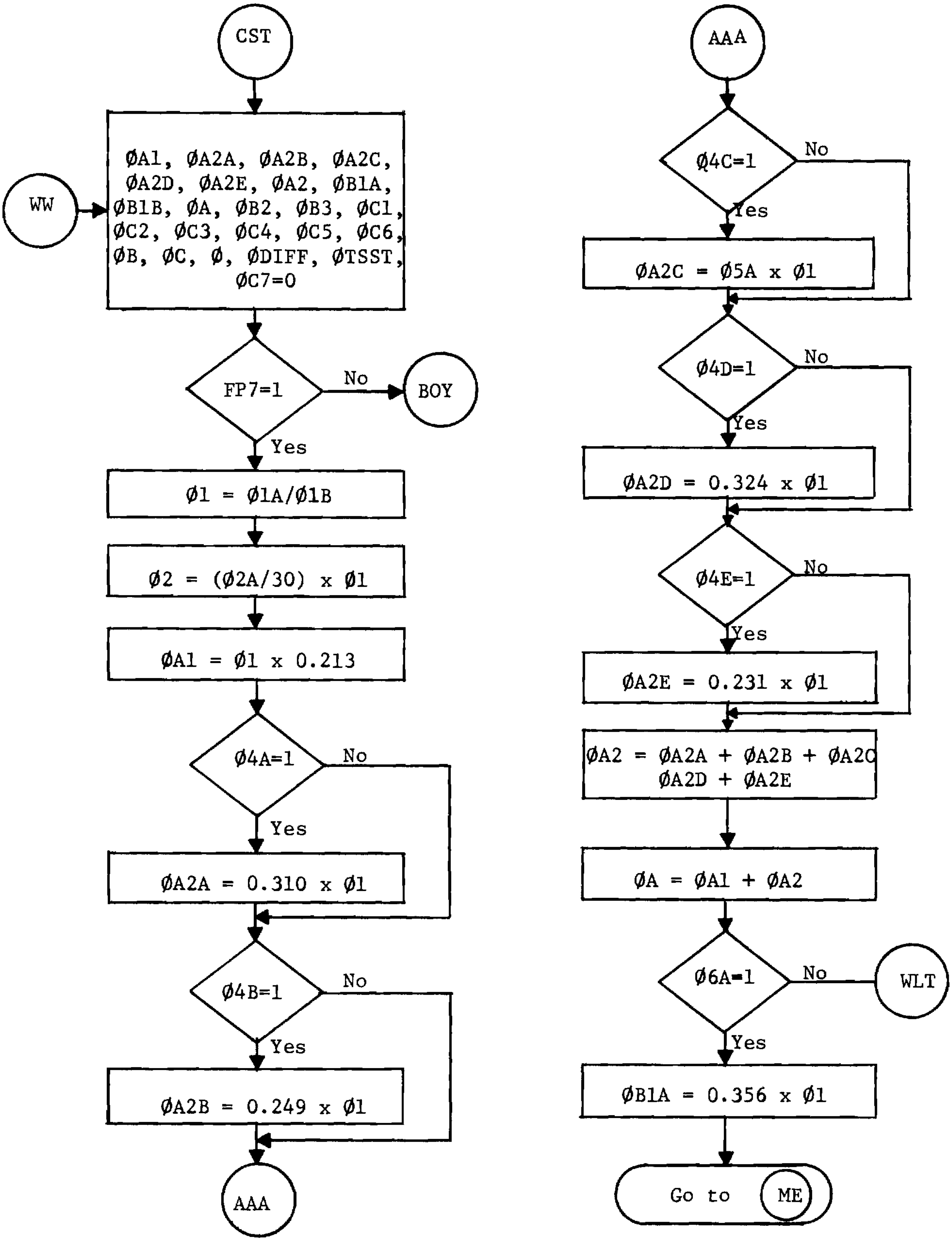

NN
M17D=1
No
Yes
MD5D = 0.240 x M6
MD5 = MD5A + MD5B + MD5C + MD5D
MD=MD1+MD2+MD3+MD4+MD5
ME1 = 0.184 x M6
ME2 = 0.184 x M6
ME = ME1 + ME2
M18A=1
No
EBT
Yes
MF1 = 1.036 x M7
MF2 = 0.063 x M8
ØØ
ØØ
MF3 = 0.169 x M12 + 0.141 x M13 + 0.150 x M14
EBT
M19A=1
No
Yes
MF4A = 0.053 x M9 x M12 + 0.053 x M10 x M13 + 0.053 x M11 x M14
Go to EC
MF4B = 0.120 x (M12 + M13 + M14) + 0.051 x (M9 x M12 + M10 x M13 + M11 x M14)
EC
MF4 = MF4A + MF4B
MF5 = 0.169xM12+0.169 x M13+0.150xM14
PP


PP
MF = MF1 + MF2 + MF3 + MF4 + MF5
M = MA + MB + MC + MD + ME + MF
MTSST= M x M20A x 1.17/60
MDIFF = MTSST - M21A
DAN
NB1, NB2, NB3, NC1A, NC1B, NC1, NC2A, NC2B, NC2, NC3A, NA, NC3B, NC3C, NC3D, NC3E, NC3, ND1A, ND1B, ND1C, ND1, NB, ND2A1, ND2A2, ND2A, ND2B, ND2C1, ND2C2, ND2C3A, ND2C3B, ND2C3C, NC, ND2C4A, ND2C3, ND2C4B, ND2C, ND, N, NDIFF, NTSST, ND2=0
FP6=1
No
CST
Yes
N2 = N2A/N2B
N3 = (N3AxN3C)/N3B/N3D
QQ
QQ
N4 = N4A/N4B
NA = 2.100 x N1
N7A=1
No
Yes
NB1 = 0.145 x N2 + 0.120 x N2 x N5
N7B=1
No
Yes
NB2 = 0.120 x N2 + 0.060 x N2 x N5
N7C=1
No
Yes
NB3 = 0.164 x N2
NB = NB1 + NB2 + NB3
RR

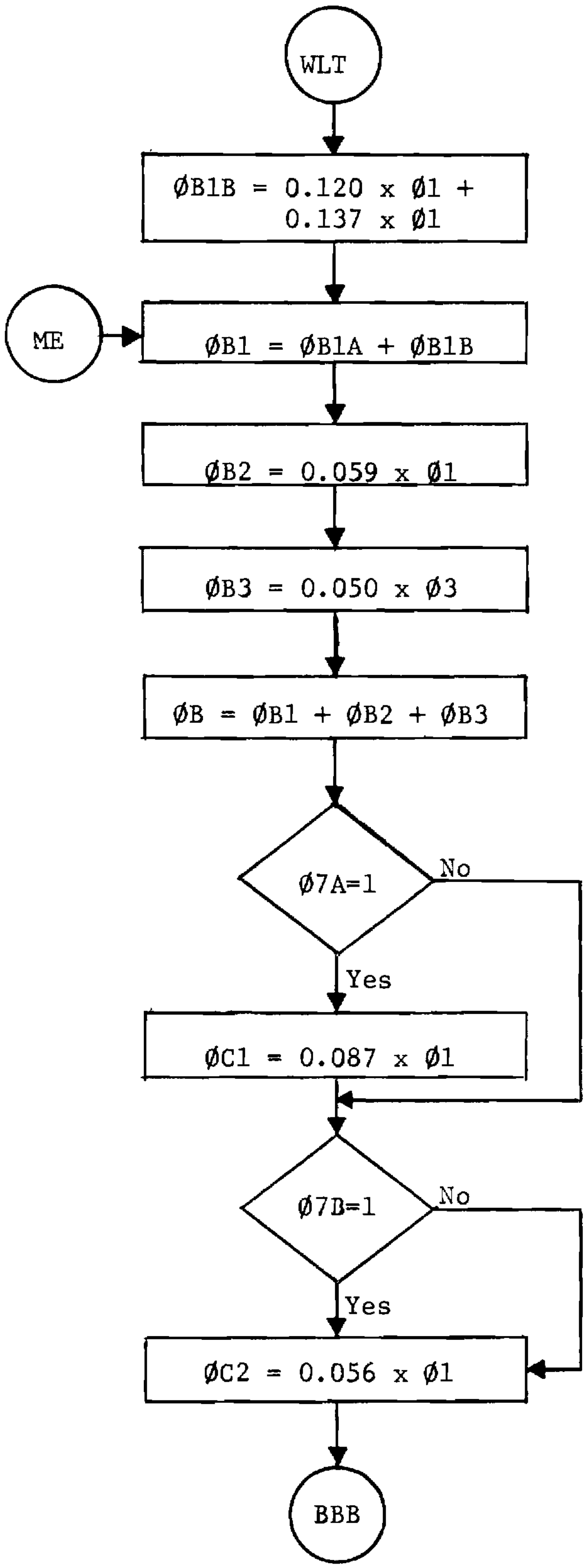

RR
N8A=1
No
Yes
NC1A = 0.055 x N3
Go to FE
NC1B = 0.190 x N3
FE
NC1 = NC1A + NC1B
N9A=1
Yes
No
NC2A = 0.111 x N3
Go to GO
NC2B = 0.109 x N3
GO
NC2 = NC2A + NC2B
SS
SS
N10A=1
No
Yes
NC3A = 0.249 x N3
N10B=1
No
Yes
NC3B = 0.355 x N3
N10C=1
No
Yes
NC3C = 0.231 x N3
N10D=1
No
Yes
NC3D = 0.324 x N3
N10E=1
No
Yes
NC3E = N11A x N3
TT

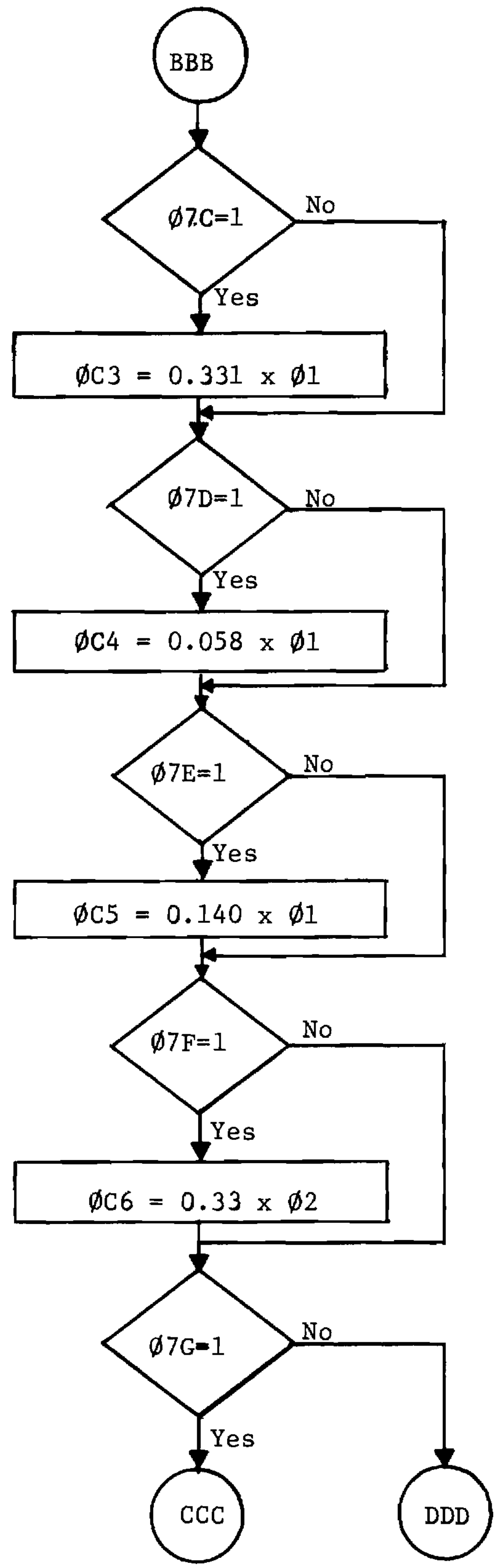

TT
NC3= NC3A + NC3B + NC3C + NC3D + NC3E
NC = NC1 + NC2 + NC3
N12A=1
No
PRH
Yes
N13A=1
No
Yes
ND1A = 0.310 x N4
N13B=1
No
Yes
ND1B = 0.237 x N4
N13C=1
No
Yes
ND1C = N14A x N4
ND1 = ND1A + ND1B + ND1C
UU
UU
N15A=1
No
Yes
N16A=1
No
Yes
ND2A1 = 0.16 x N4
Go to HE
ND2A2 = 0.12 x N4
HE
ND2A = ND2A1 + ND2A2
Go to IZ
ND2B = 0.100 x N4
N17A=1
No
Yes
ND2C1 = 0.145 x N4
Go to JH
ND2C2 = 0.125 x N4
VV

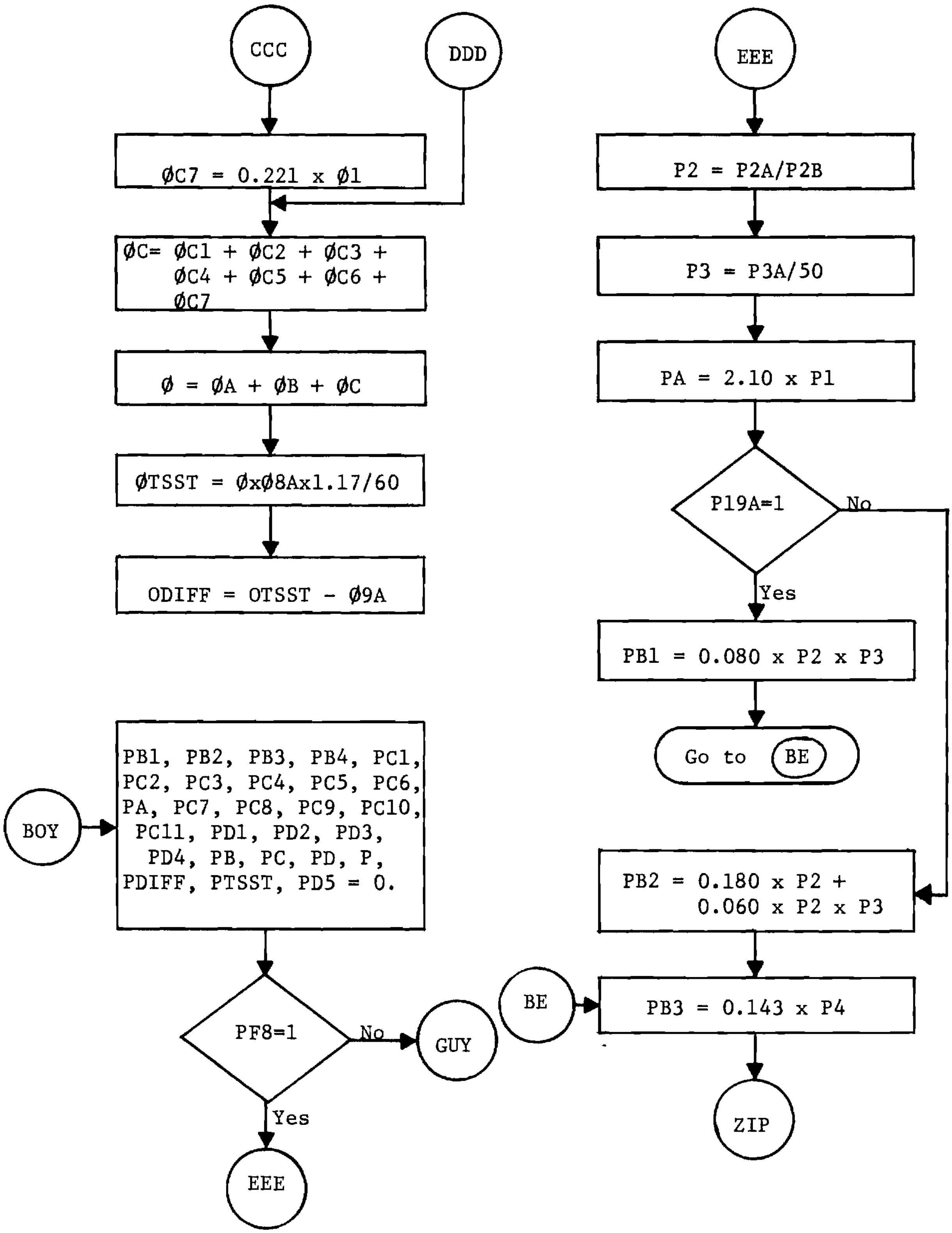

VV
JH
N18A=1
No
Yes
ND2C3A = 0.310 x N4
N18B=1
No
Yes
ND2C3B = 0.237 x N4
N18C=1
Yes
No
ND2C3C = N14A x N4
ND2C3 = ND2C3A + ND2C3B + ND2C3C
N19A=1
No
JBS
Yes
ND2C4A = 0.145 x N4 + 0.120 x N4 xN6
Go to KS
JBS
ND2C4B = 0.120 x N4 + 0.060 x N4 + N6
KS
ND2C= ND2C1 + ND2C2 + ND2C3 + ND2C4A + ND2C4B
IZ
ND2 = ND2A + ND2B + ND2C
ND = ND1 + ND2
PRH
N = NA + NB + NC + ND
NTSST= N x N20A x 1.17/60
NDIFF = NTSST - N21A
WW

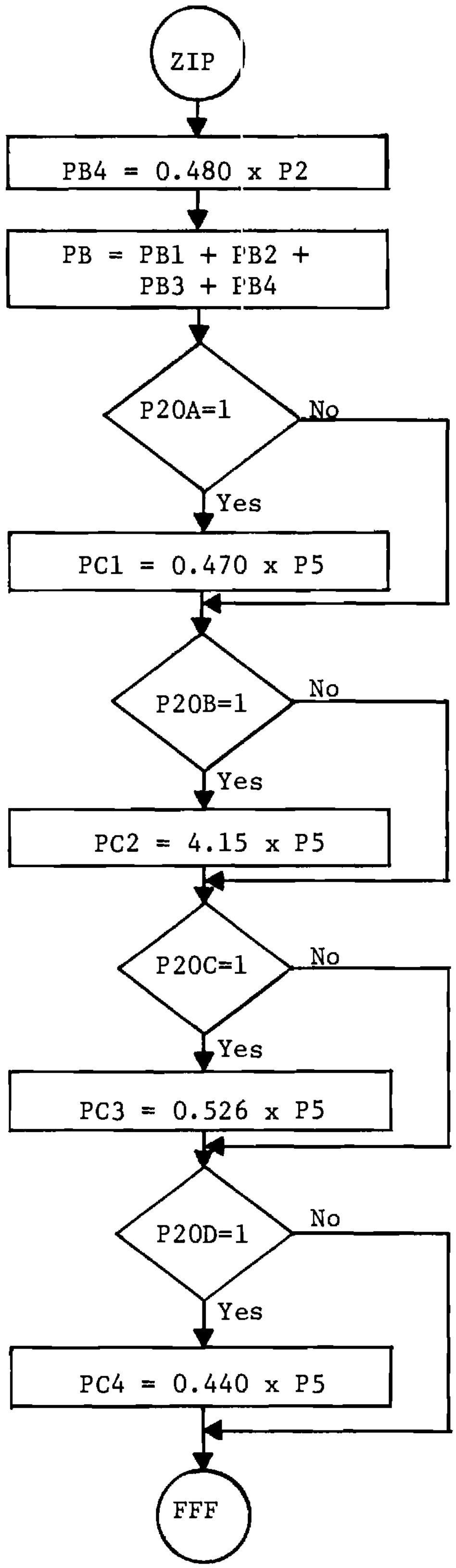


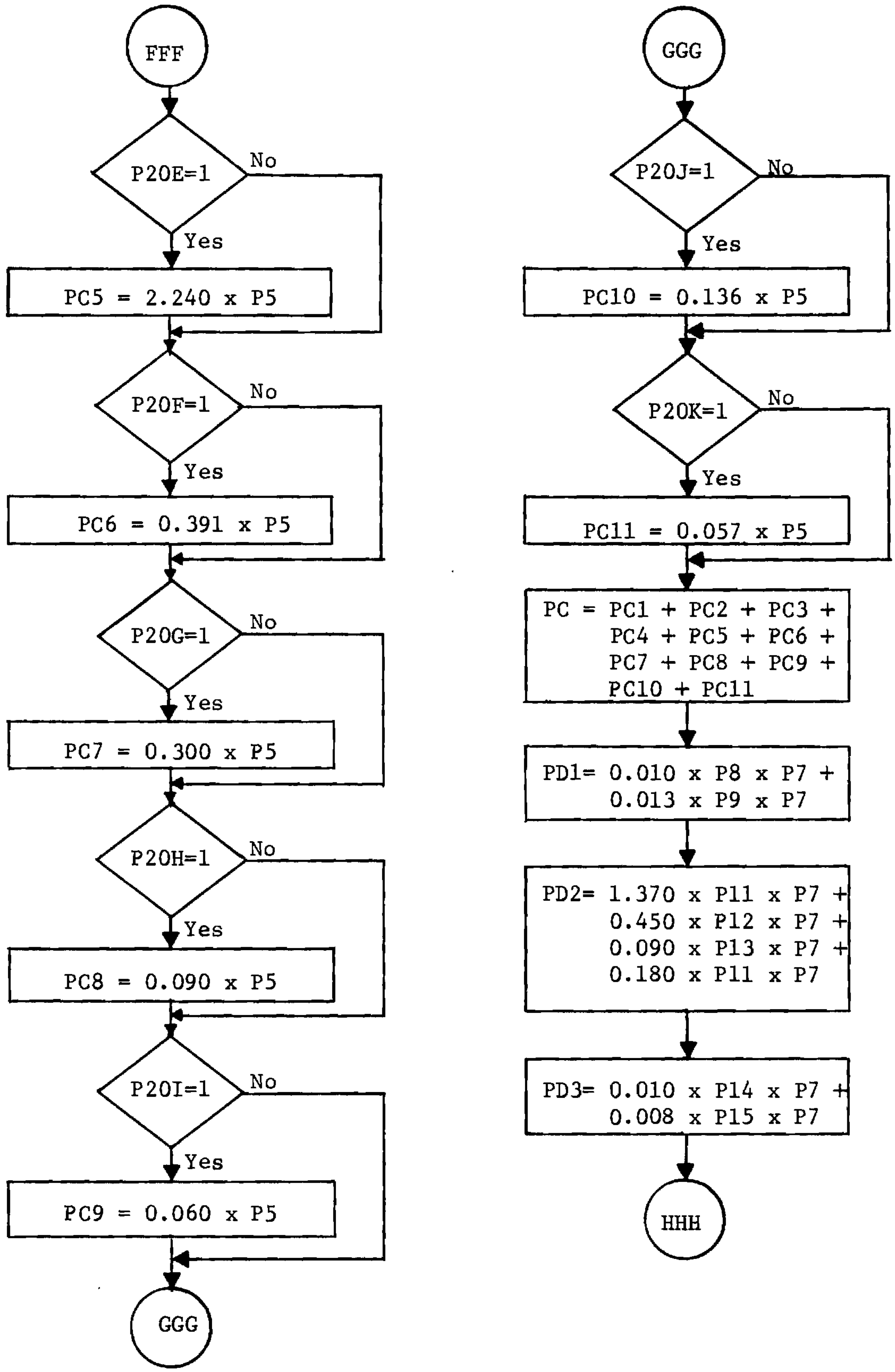
CST
WW
ØA1, ØA2A, ØA2B, ØA2C, ØA2D, ØA2E, ØA2, ØB1A, ØB1B, ØA, ØB2, ØB3, ØC1, ØC2, ØC3, ØC4, ØC5, ØC6, ØB, ØC, Ø, ØDIFF, ØTSST, ØC7=0
FP7=1
No
BOY
Yes
Ø1 = Ø1A/Ø1B
Ø2 = (Ø2A/30) x Ø1
ØA1 = Ø1 x 0.213
Ø4A=1
No
Yes
ØA2A = 0.310 x Ø1
Ø4B=1
No
Yes
ØA2B = 0.249 x Ø1
AAA
AAA
Ø4C=1
No
Yes
ØA2C = Ø5A x Ø1
Ø4D=1
No
Yes
ØA2D = 0.324 x Ø1
Ø4E=1
No
Yes
ØA2E = 0.231 x Ø1
ØA2 = ØA2A + ØA2B + ØA2C
ØA2D + ØA2E
ØA = ØA1 + ØA2
Ø6A=1
No
WLT
Yes
ØB1A = 0.356 x Ø1
Go to ME

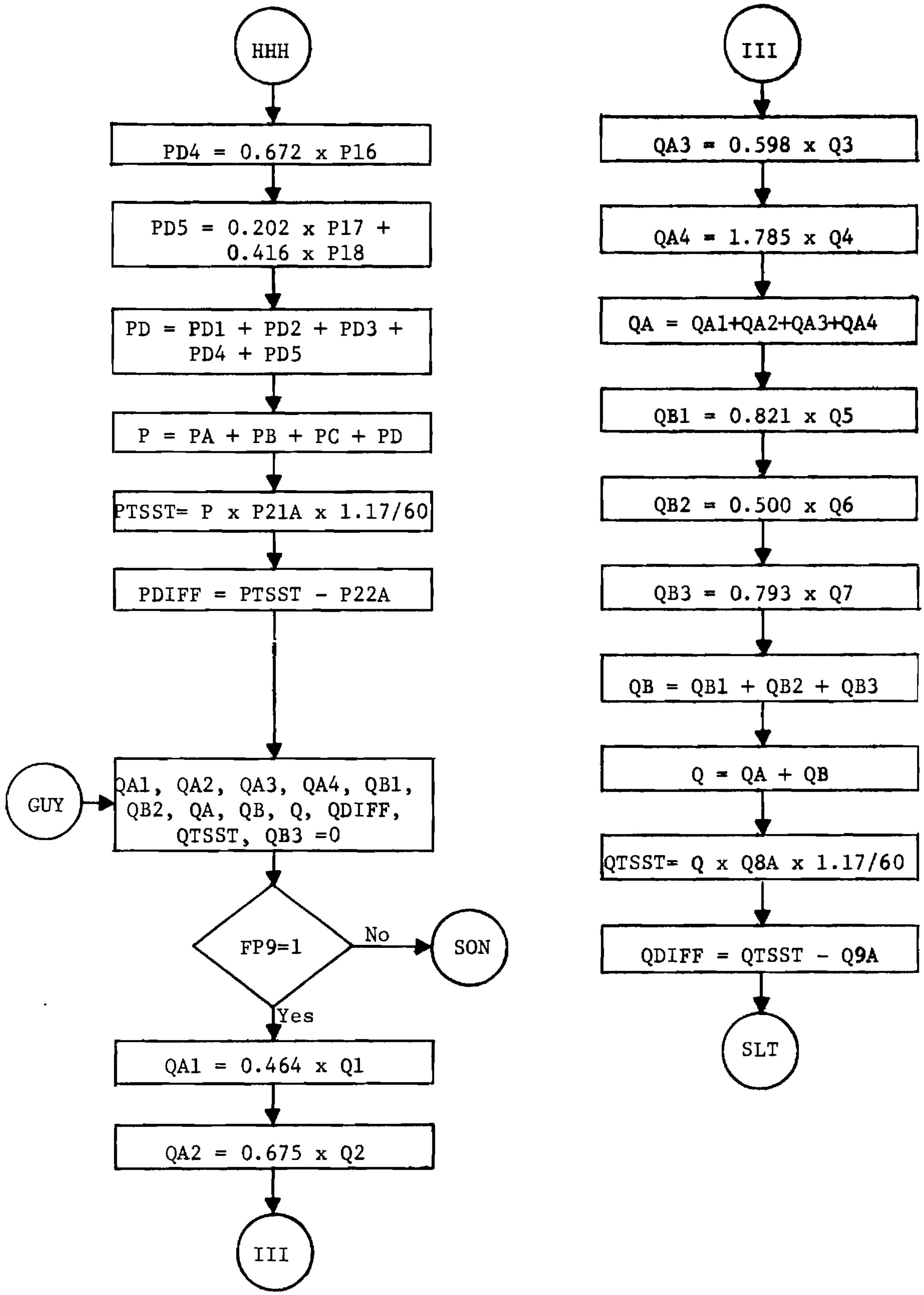

WLT
ØB1B = 0.120 x Ø1 + 0.137 x Ø1
ME
ØB1 = ØB1A + ØB1B
ØB2 = 0.059 x Ø1
ØB3 = 0.050 x Ø3
ØB = ØB1 + ØB2 + ØB3
Ø7A=1
No
Yes
ØC1 = 0.087 x Ø1
Ø7B=1
No
Yes
ØC2 = 0.056 x Ø1
BBB

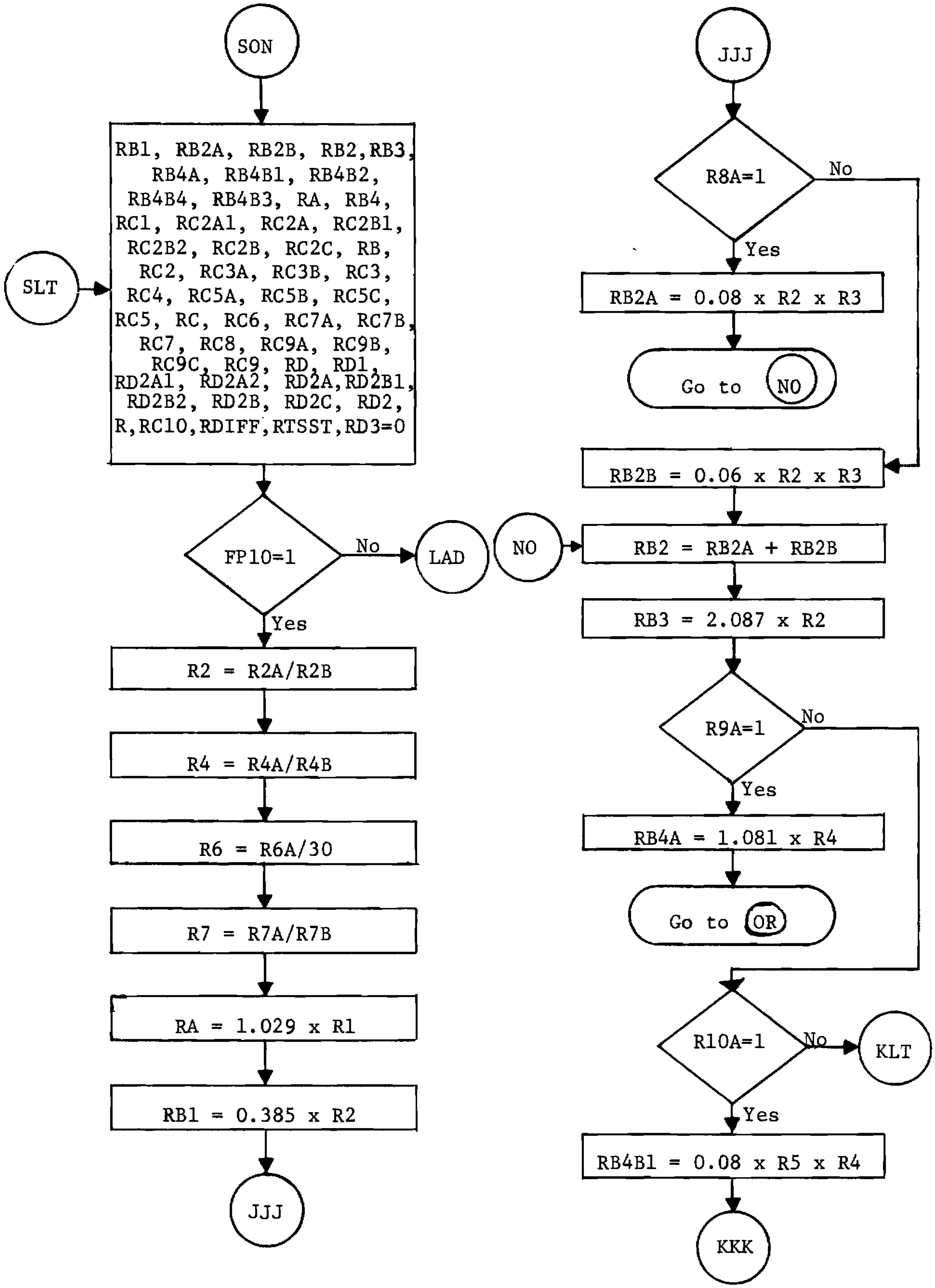

BBB
Ø7C=1
No
Yes
ØC3 = 0.331 x Ø1
Ø7D=1
No
Yes
ØC4 = 0.058 x Ø1
Ø7E=1
No
Yes
ØC5 = 0.140 x Ø1
Ø7F=1
No
Yes
ØC6 = 0.33 x Ø2
Ø7G=1
No
Yes
CCC
DDD

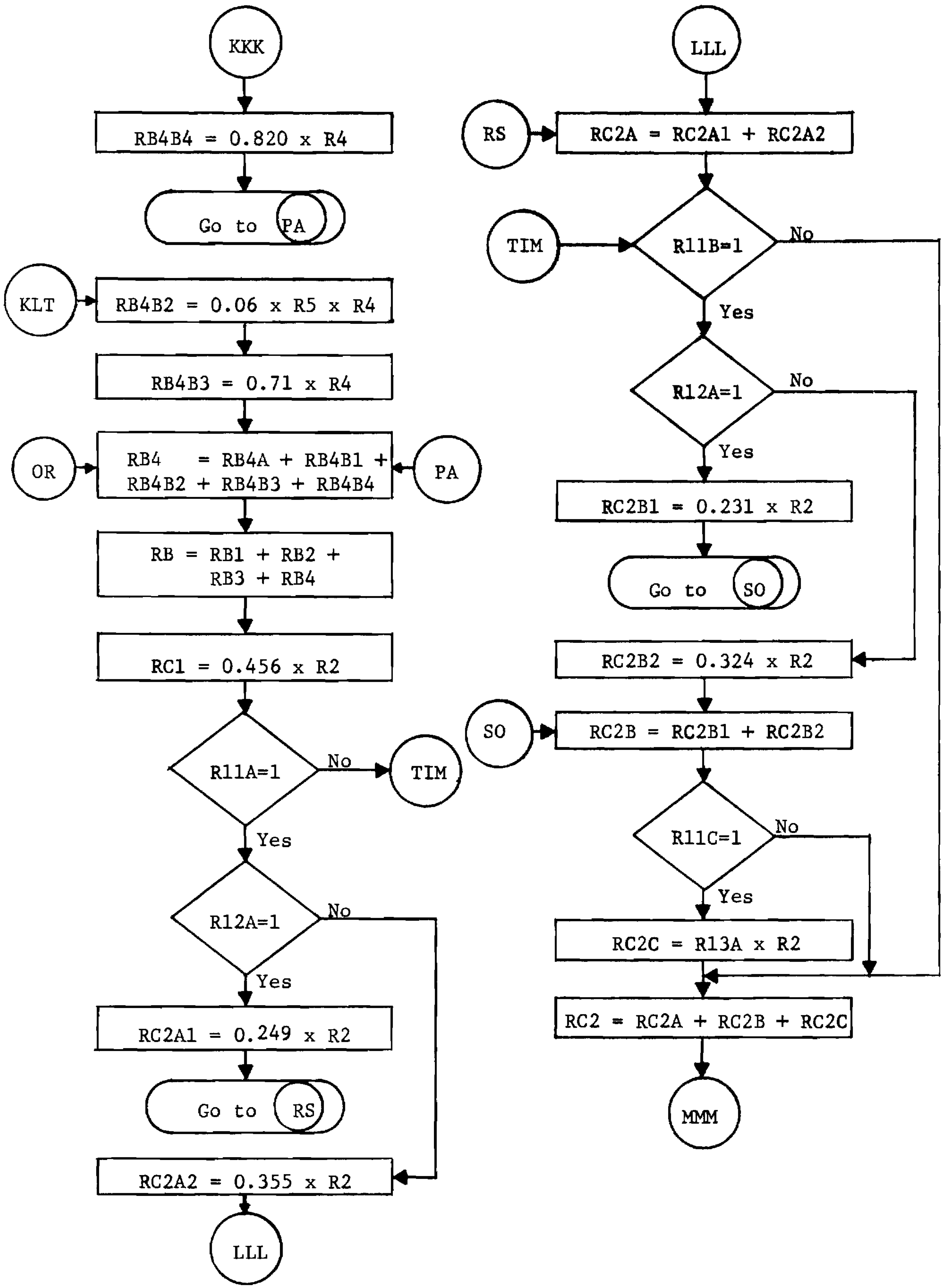

CCC
DDD
ØC7 = 0.221 x Ø1
ØC= ØC1 + ØC2 + ØC3 + ØC4 + ØC5 + ØC6 + ØC7
Ø = ØA + ØB + ØC
ØTSST = ØxØ8Ax1.17/60
ODIFF = OTSST - Ø9A
BOY
PB1, PB2, PB3, PB4, PC1, PC2, PC3, PC4, PC5, PC6, PA, PC7, PC8, PC9, PC10, PC11, PD1, PD2, PD3, PD4, PB, PC, PD, P, PDIFF, PTSST, PD5 = 0.
PF8=1
No
GUY
Yes
EEE
EEE
P2 = P2A/P2B
P3 = P3A/50
PA = 2.10 x P1
P19A=1
No
Yes
PB1 = 0.080 x P2 x P3
Go to BE
PB2 = 0.180 x P2 + 0.060 x P2 x P3
BE
PB3 = 0.143 x P4
ZIP


ZIP
PB4 = 0.480 x P2
PB = PB1 + PB2 +
PB3 + PB4
P20A=1
No
Yes
PC1 = 0.470 x P5
P20B=1
No
Yes
PC2 = 4.15 x P5
P20C=1
No
Yes
PC3 = 0.526 x P5
P20D=1
No
Yes
PC4 = 0.440 x P5
FFF

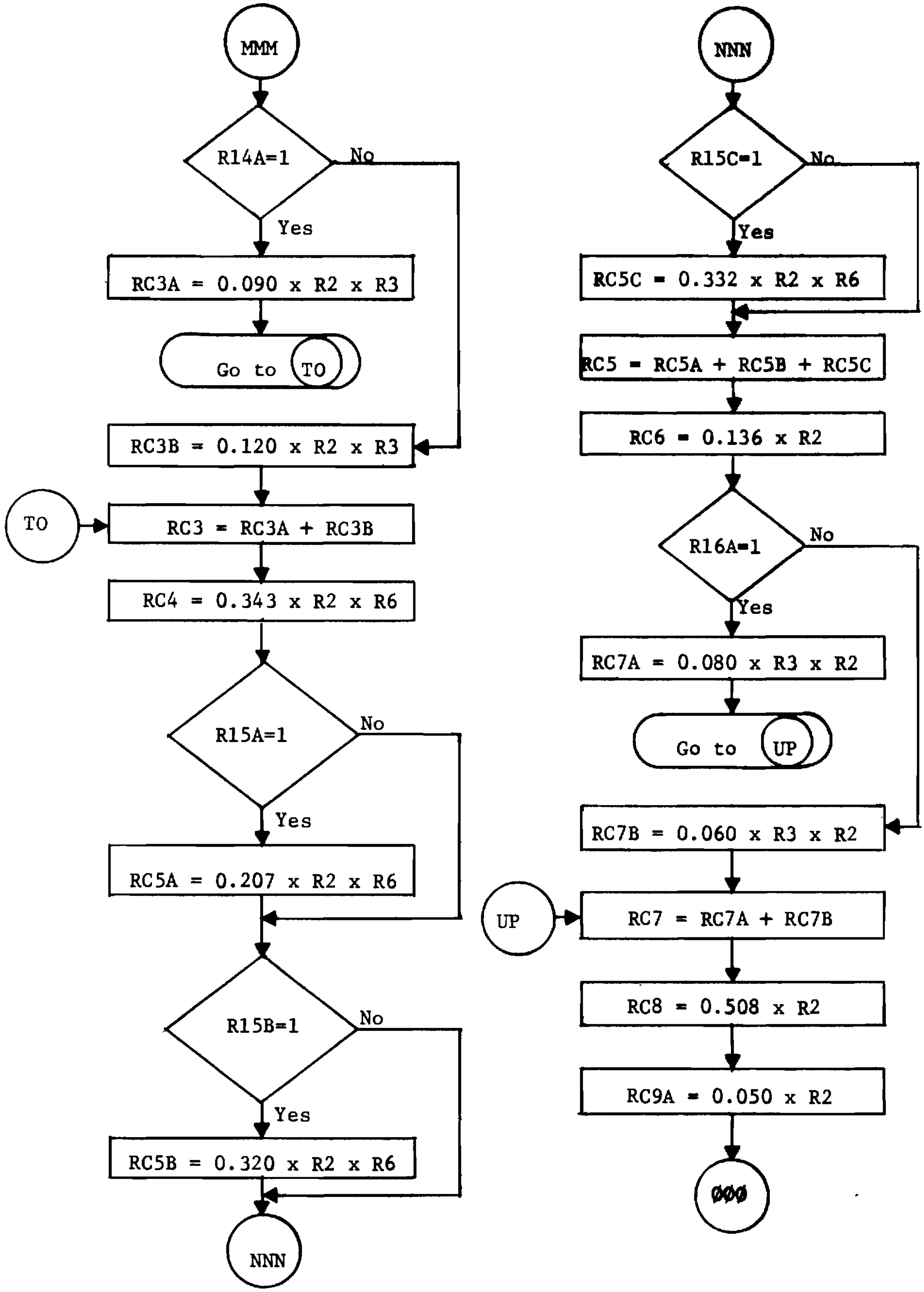

FFF
P20E=1
No
Yes
PC5 = 2.240 x P5
P20F=1
No
Yes
PC6 = 0.391 x P5
P20G=1
No
Yes
PC7 = 0.300 x P5
P20H=1
No
Yes
PC8 = 0.090 x P5
P20I=1
No
Yes
PC9 = 0.060 x P5
GGG
GGG
P20J=1
No
Yes
PC10 = 0.136 x P5
P20K=1
No
Yes
PC11 = 0.057 x P5
PC = PC1 + PC2 + PC3 + PC4 + PC5 + PC6 + PC7 + PC8 + PC9 + PC10 + PC11
PD1= 0.010 x P8 x P7 + 0.013 x P9 x P7
PD2= 1.370 x P11 x P7 + 0.450 x P12 x P7 + 0.090 x P13 x P7 + 0.180 x P11 x P7
PD3= 0.010 x P14 x P7 + 0.008 x P15 x P7
HHH


HHH
PD4 = 0.672 x P16
PD5 = 0.202 x P17 + 0.416 x P18
PD = PD1 + PD2 + PD3 + PD4 + PD5
P = PA + PB + PC + PD
PTSST= P x P21A x 1.17/60
PDIFF = PTSST - P22A
GUY
QA1, QA2, QA3, QA4, QB1, QB2, QA, QB, Q, QDIFF, QTSST, QB3 =0
FP9=1
No
SON
Yes
QA1 = 0.464 x Q1
QA2 = 0.675 x Q2
III
III
QA3 = 0.598 x Q3
QA4 = 1.785 x Q4
QA = QA1+QA2+QA3+QA4
QB1 = 0.821 x Q5
QB2 = 0.500 x Q6
QB3 = 0.793 x Q7
QB = QB1 + QB2 + QB3
Q = QA + QB
QTSST= Q x Q8A x 1.17/60
QDIFF = QTSST - Q9A
SLT

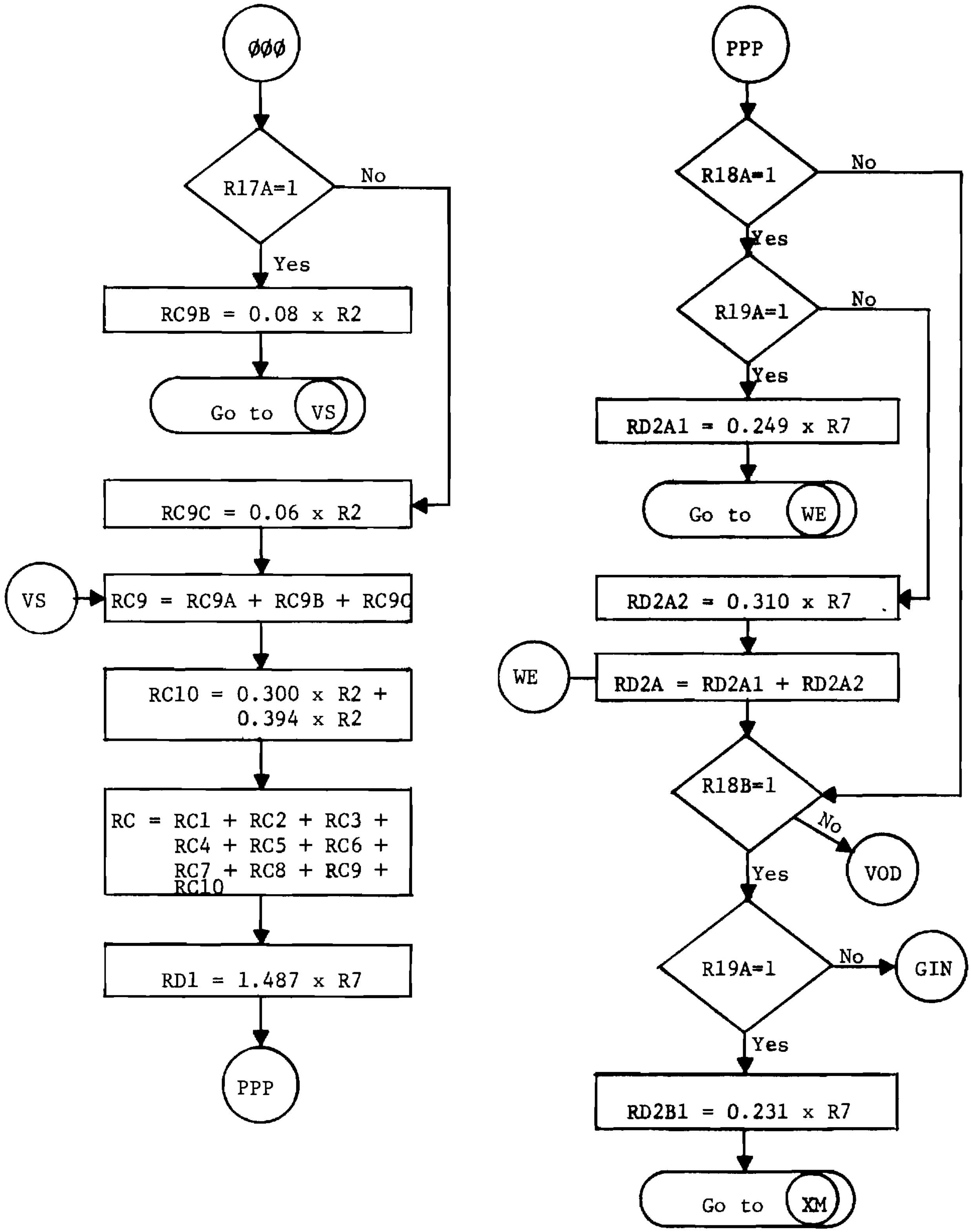

SON
RB1, RB2A, RB2B, RB2,RB3, RB4A, RB4B1, RB4B2, RB4B4, RB4B3, RA, RB4, RC1, RC2A1, RC2A, RC2B1, RC2B2, RC2B, RC2C, RB, RC2, RC3A, RC3B, RC3, RC4, RC5A, RC5B, RC5C, RC5, RC, RC6, RC7A, RC7B, RC7, RC8, RC9A, RC9B, RC9C, RC9, RD, RD1, RD2A1, RD2A2, RD2A,RD2B1, RD2B2, RD2B, RD2C, RD2, R,RC10,RDIFF,RTSST,RD3=0
SLT
FP10=1
No
LAD
Yes
R2 = R2A/R2B
R4 = R4A/R4B
R6 = R6A/30
R7 = R7A/R7B
RA = 1.029 x R1
RB1 = 0.385 x R2
JJJ
JJJ
R8A=1
No
Yes
RB2A = 0.08 x R2 x R3
Go to NO
RB2B = 0.06 x R2 x R3
NO
RB2 = RB2A + RB2B
RB3 = 2.087 x R2
R9A=1
No
Yes
RB4A = 1.081 x R4
Go to OR
R10A=1
No
KLT
Yes
RB4B1 = 0.08 x R5 x R4
KKK



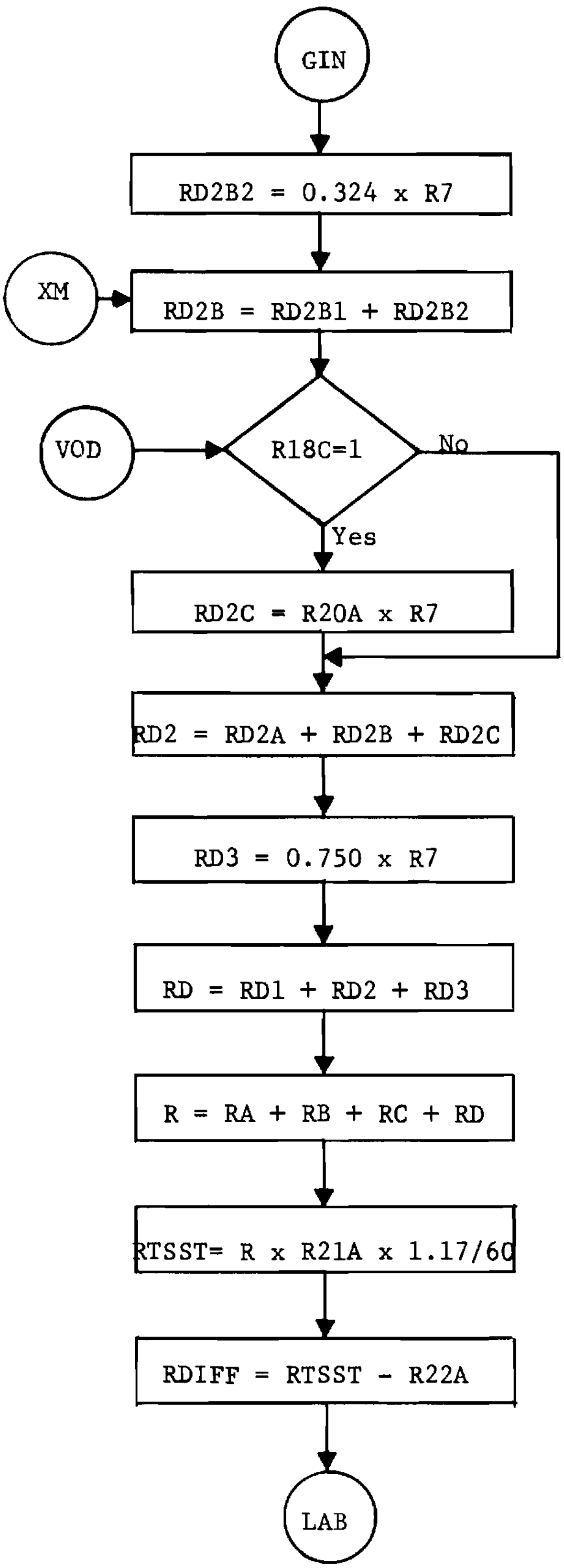
KKK
RB4B4 = 0.820 x R4
Go to PA
KLT
RB4B2 = 0.06 x R5 x R4
RB4B3 = 0.71 x R4
OR
RB4 = RB4A + RB4B1 + RB4B2 + RB4B3 + RB4B4
PA
RB = RB1 + RB2 + RB3 + RB4
RC1 = 0.456 x R2
R11A=1
No
TIM
Yes
R12A=1
No
Yes
RC2A1 = 0.249 x R2
Go to RS
RC2A2 = 0.355 x R2
LLL
LLL
RS
RC2A = RC2A1 + RC2A2
TIM
R11B=1
No
Yes
R12A=1
No
Yes
RC2B1 = 0.231 x R2
Go to SO
RC2B2 = 0.324 x R2
SO
RC2B = RC2B1 + RC2B2
R11C=1
No
Yes
RC2C = R13A x R2
RC2 = RC2A + RC2B + RC2C
MMM

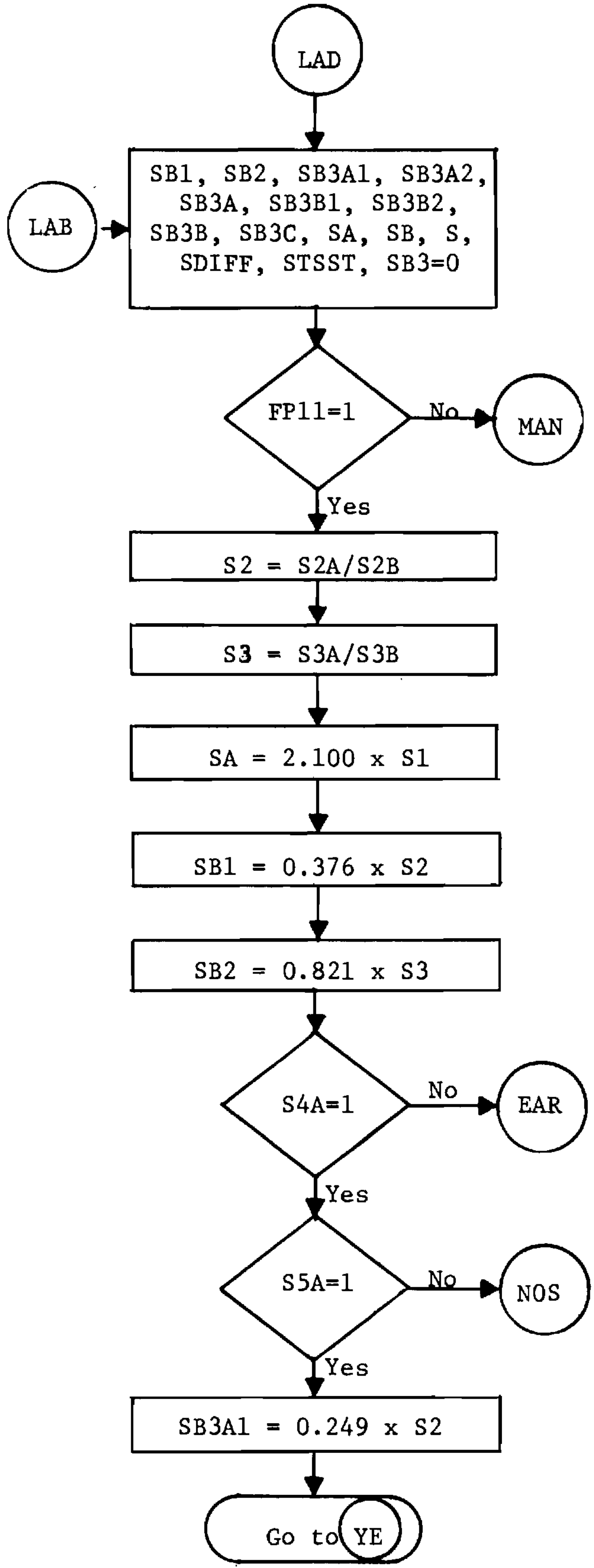


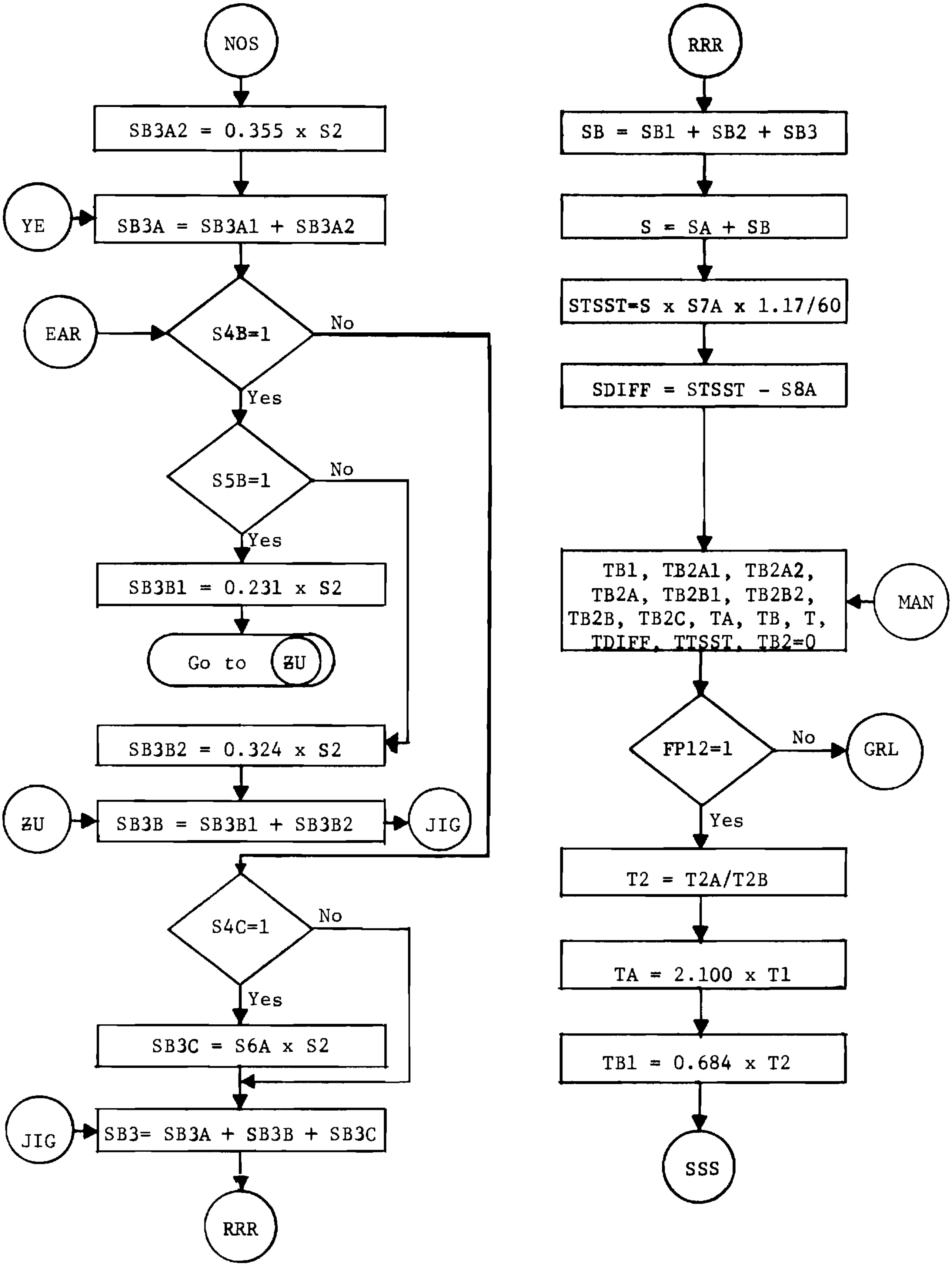
MMM
R14A=1
No
Yes
RC3A = 0.090 x R2 x R3
Go to TO
RC3B = 0.120 x R2 x R3
TO
RC3 = RC3A + RC3B
RC4 = 0.343 x R2 x R6
R15A=1
No
Yes
RC5A = 0.207 x R2 x R6
R15B=1
No
Yes
RC5B = 0.320 x R2 x R6
NNN
NNN
R15C=1
No
Yes
RC5C = 0.332 x R2 x R6
RC5 = RC5A + RC5B + RC5C
RC6 = 0.136 x R2
R16A=1
No
Yes
RC7A = 0.080 x R3 x R2
Go to UP
RC7B = 0.060 x R3 x R2
UP
RC7 = RC7A + RC7B
RC8 = 0.508 x R2
RC9A = 0.050 x R2
ØØØ

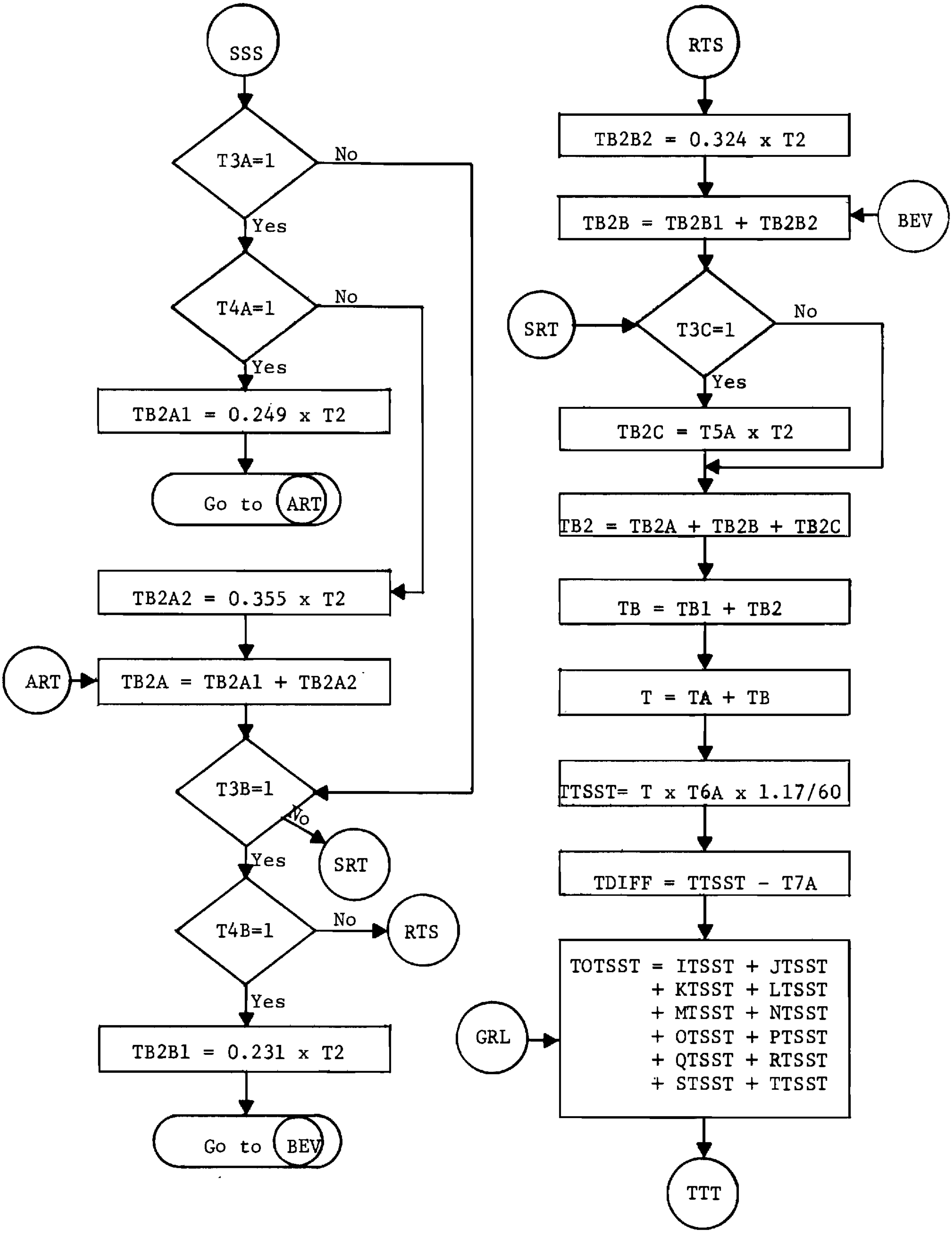


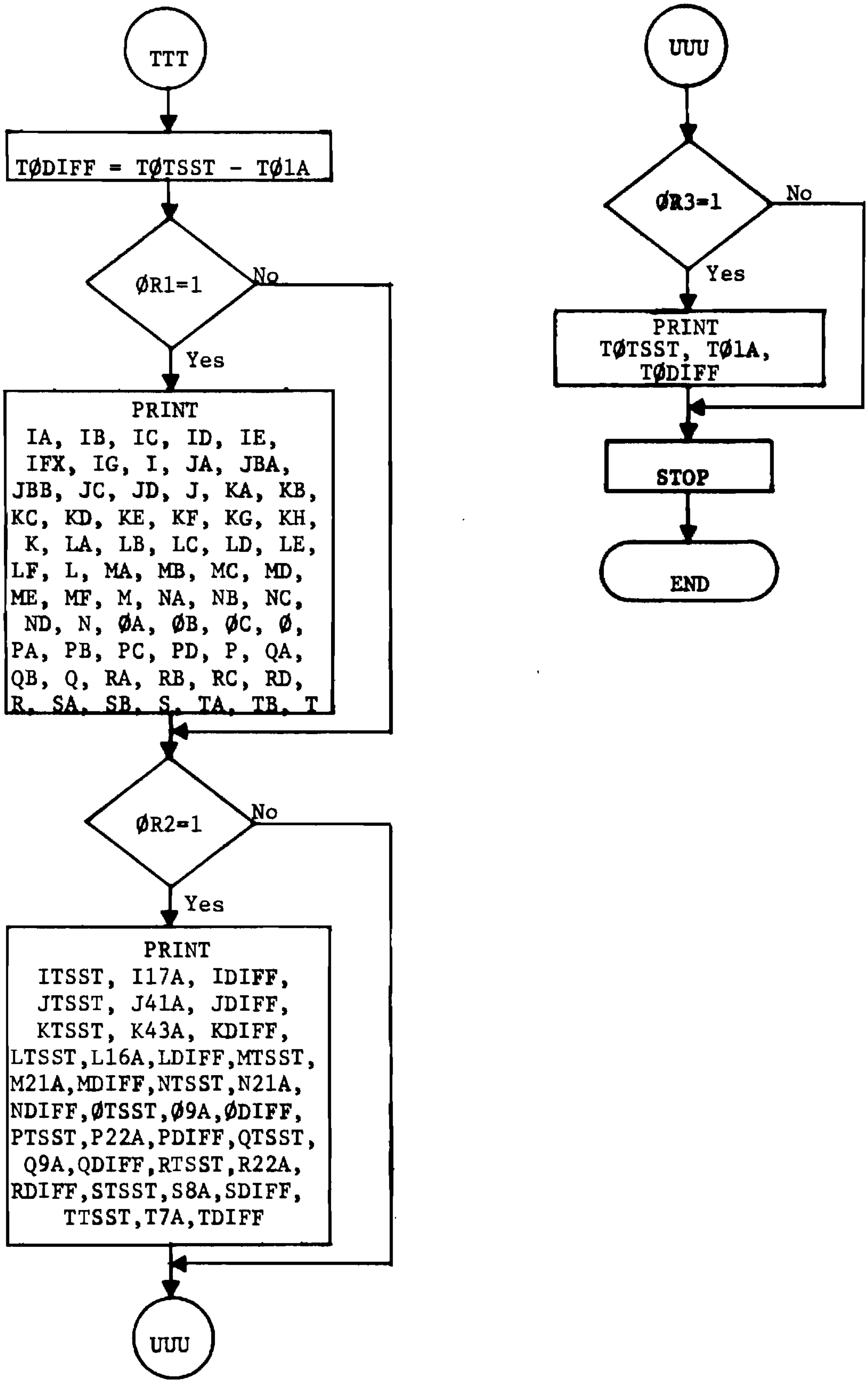
ØØØ
R17A=1
No
Yes
RC9B = 0.08 x R2
Go to VS
RC9C = 0.06 x R2
VS
RC9 = RC9A + RC9B + RC9C
RC10 = 0.300 x R2 + 0.394 x R2
RC = RC1 + RC2 + RC3 + RC4 + RC5 + RC6 + RC7 + RC8 + RC9 + RC10
RD1 = 1.487 x R7
PPP
PPP
R18A=1
No
Yes
R19A=1
No
Yes
RD2A1 = 0.249 x R7
Go to WE
RD2A2 = 0.310 x R7
WE
RD2A = RD2A1 + RD2A2
R18B=1
No
VOD
Yes
R19A=1
No
GIN
Yes
RD2B1 = 0.231 x R7
Go to XM


GIN
RD2B2 = 0.324 x R7
XM
RD2B = RD2B1 + RD2B2
VOD
R18C=1
No
Yes
RD2C = R20A x R7
RD2 = RD2A + RD2B + RD2C
RD3 = 0.750 x R7
RD = RD1 + RD2 + RD3
R = RA + RB + RC + RD
RTSST= R x R21A x 1.17/60
RDIFF = RTSST - R22A
LAB


LAD
LAB
SB1, SB2, SB3A1, SB3A2, SB3A, SB3B1, SB3B2, SB3B, SB3C, SA, SB, S, SDIFF, STSST, SB3=0
FP11=1
No
MAN
Yes
S2 = S2A/S2B
S3 = S3A/S3B
SA = 2.100 x S1
SB1 = 0.376 x S2
SB2 = 0.821 x S3
S4A=1
No
EAR
Yes
S5A=1
No
NOS
Yes
SB3A1 = 0.249 x S2
Go to YE


NOS
SB3A2 = 0.355 x S2
YE
SB3A = SB3A1 + SB3A2
EAR
S4B=1
No
Yes
S5B=1
No
Yes
SB3B1 = 0.231 x S2
Go to ZU
SB3B2 = 0.324 x S2
ZU
SB3B = SB3B1 + SB3B2
JIG
S4C=1
No
Yes
SB3C = S6A x S2
JIG
SB3= SB3A + SB3B + SB3C
RRR
RRR
SB = SB1 + SB2 + SB3
S = SA + SB
STSST=S x S7A x 1.17/60
SDIFF = STSST - S8A
TB1, TB2A1, TB2A2, TB2A, TB2B1, TB2B2, TB2B, TB2C, TA, TB, T, TDIFF, TTSST, TB2=0
MAN
FP12=1
No
GRL
Yes
T2 = T2A/T2B
TA = 2.100 x T1
TB1 = 0.684 x T2
SSS


SSS
T3A=1
No
Yes
T4A=1
No
Yes
TB2A1 = 0.249 x T2
Go to ART
TB2A2 = 0.355 x T2
ART
TB2A = TB2A1 + TB2A2
T3B=1
No
SRT
Yes
T4B=1
No
RTS
Yes
TB2B1 = 0.231 x T2
Go to BEV
RTS
TB2B2 = 0.324 x T2
TB2B = TB2B1 + TB2B2
BEV
SRT
T3C=1
No
Yes
TB2C = T5A x T2
TB2 = TB2A + TB2B + TB2C
TB = TB1 + TB2
T = TA + TB
TTSST= T x T6A x 1.17/60
TDIFF = TTSST - T7A
TOTSST = ITSST + JTSST + KTSST + LTSST + MTSST + NTSST + OTSST + PTSST + QTSST + RTSST + STSST + TTSST
GRL
TTT


TTT
TØDIFF = TØTSST - TØ1A
ØR1=1
No
Yes
PRINT
IA, IB, IC, ID, IE,
IFX, IG, I, JA, JBA,
JBB, JC, JD, J, KA, KB,
KC, KD, KE, KF, KG, KH,
K, LA, LB, LC, LD, LE,
LF, L, MA, MB, MC, MD,
ME, MF, M, NA, NB, NC,
ND, N, ØA, ØB, ØC, Ø,
PA, PB, PC, PD, P, QA,
QB, Q, RA, RB, RC, RD,
R, SA, SB, S, TA, TB, T
ØR2=1
No
Yes
PRINT
ITSST, I17A, IDIFF,
JTSST, J41A, JDIFF,
KTSST, K43A, KDIFF,
LTSST,L16A,LDIFF,MTSST,
M21A,MDIFF,NTSST,N21A,
NDIFF,ØTSST,Ø9A,ØDIFF,
PTSST,P22A,PDIFF,QTSST,
Q9A,QDIFF,RTSST,R22A,
RDIFF,STSST,S8A,SDIFF,
TTSST,T7A,TDIFF
UUU
UUU
ØR3=1
No
Yes
PRINT
TØTSST, TØ1A,
TØDIFF
STOP
END

APPENDIX B

SECTION 5

DATA COLLECTION INPUT FORMS

FIGURE B1. Existing Medical Record Staff Allocation by Direct Work Operation Data Collection Input Form

Hospital: ____________________

Date: ____________________

Initials: ____________________

Sheet: 1 of 1

Staff Member	Hours Worked/ Week	Direct Work Operations												
		I Rec Pick	J Assy Anal	K Trans	L Code Abst	M Index	N Num File	O Ret Loc Cont	P Stat BC	Q PN	R Corr	S Outp Rec	T Emer Rec	Other
1)														
2)														
3)														
4)														
5)														
6)														
7)														
8)														
9)														
10)														
11)														
12)														
13)														
14)														
15)														
16)														
17)														
18)														
19)														
20)														
21)														
22)														
23)														
24)														
25)														
TOTALS														
Computer Input		I17A	J41A	K43A	L16A	M21A	N21A	O9A	P22A	Q9A	R22A	S8A	T7A	

FIGURE B2. Normal Workdays on the Medical Record Staff Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 1 of 1

	Direct Work Operations												
	General	I Rec Pick	J Assy Anal	K Tran	L Code Abst	M Index	N Num File	O Rec Loc Cont	P Stat BC	Q Phone	R Corr	S Out Pat	T Emer
Week: 5D1S													
5D2S													
5D3S													
6D1S													
6D2S													
6D3S													
7D1S													
7D2S													
7D3S													
Computer		I16A	J13B	K1B	L15A	M20A	N20A	O8A	P21A	Q8A	R7B	S7A	T6A
Inputs			J40A	K42A							R21A		
Month:													
Computer				K2B	L8B	M8IIB		O1B	P2B		R2B	S3B	
Inputs				K4B		M12B			P4B		R4B		
"				K6B		M13B							
"				K7B		M14B							
"				K8IB									
"				K10IB									
"				K8IIB									
"				K13IIB									
Year:													
Computer			J5A	K14B	L2B	M2B	N2B		P5B			S2B	T2B
Inputs					L10B	M4B	N3D						
"						M6B	N4B						
"						M8IB							

FIGURE B3. Pages by Type in the Medical Record Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Circle applicable type of record:
1. Newborn J7A 2. Obstetrics J8A 3. Medical J9A Surgical J10A

Sheet: 1 of 1

Number	L O S	Discharge Diagnosis	Pages in Last Admission														No. Admissions	Total	Comments
			Adm & Dis Sheet	Lab	X-Ray	In Hal Therapy	Physical Therapy	Nurse Notes	Progress Notes	Doctors Orders	Pathology	Chart Sheet	Flow Sheet	Other	Total				
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30																			

FIGURE B4. **Multi-day and Numerical Sample Inputs Data Collection Input Form**

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 1 of 4

	Computer Input Variable							
	Transcription							
Number	K2A Month's Total Incomplete Records	K4A Total Monthly Counted Records	K6A Month's Total Deliquent Reports per Doctor	K7A Month's Belts or Discs	K8IA or K8IIA Month's Total Reports	K9IA Total Pages in 30 Reports	K10IA Month's Total Operation Diagnoses	K11IA Full Lines in 30 Pages
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
TOTAL								

FIGURE B4. Multi-day and Numerical Sample Inputs Data Collection Input Form

Hospital: ______________________

Date: ______________________

Initials: ______________________

Sheet: 2 of 4

	Computer Input Variable							
	Transcription		Coding & Abstracting		Indexing			
Number	K12IA Partial Lines in 30 Pages	K13IIA Month's Total Batches	L8A Total Monthly PAS Batches	L9A Total Items on 30 Forms	M8IIA Month's Total Indexed Records	M9A Items on 30 Disease Index Cards	M10A Items on 30 Operation Index Cards	M11A Items on 30 Physician Index Cards
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
TOTAL								

FIGURE B4. Multi-day and Numerical Sample Inputs Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 3 of 4

	Computer Input Variable							
	Indexing			Filing		Retrieval		Statistical
	M12A Disease Index Cards per Month	M13A Operation Index Cards per Month	M14A Physician Index Cards per Month	N3A Records Filed per Month	N3B Discharges Typical Month	01A Records Retrieved in a Typical Month	02A Total Number of Transfers	P2A Total Monthly Report Forms
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
TOTAL								

FIGURE B4. Multi-day and Numerical Sample Inputs Data Collection Input Form

Hospital: ________

Date: ________

Initials: ________

Sheet: 4 of 4

	Computer Input Variables							
	Statistical			Correspondence				Outpatient
	P3A Average Number of Items per Report	P3A Average Number of Items per Report (cont'd)	P4A Total Monthly Records Reported	R2A Total Monthly Request Letters	R4A Total Monthly Deficient Requests	R6A Total Pages Copied for 30 Reports	R7A Total Weekly In-Person Requests	S3A Total Monthly Deficient Records
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
TOTAL								

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 1 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
TOTAL STAFFING:				
Total Existing Staff Time	T01A			
FUNCTIONS PERFORMED:				
Record Pickup	FP1			
Record Assembly and Analysis	FP2			
Transcription	FP3			
Coding and Abstracting	FP4			
Indexing	FP5			
Numbering and Filing of Record	FP6			
Retrieval and Record Location Control	FP7			
Preparing Statistical Reports and Birth Certificates	FP8			
Incoming Phone Calls and Outgoing Calls for Missing Records	FP9			
Correspondence and In Person Information Requests	FP10			
Outpatient Records	FP11			
Emergency Room Records	FP12			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 2 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
RECORD PICKUP WORKLOAD STATISTICS:				
Trips Per Day	I1			
Pickups Per Trip	I2			
Walked Paces Per Trip in Unobstructed Area	I3			
Walked Paces Per Trip in Obstructed Area	I4			
Unobstructed Cart Paces Per Trip	I5			
Obstructed Cart Paces Per Trip	I6			
Cart Starts and Stops Per Trip	I7A			
Elevator Rides Per Trip	I8			
Traffic Floors Per Trip	I9			
Elevator Floors Per Trip	I10			
Floors Per Upward Trip by Stairway	I11			
Floors Per Downward Trip by Stairway	I12			
Dumbwaiter Trips Per Day	I13			
Pneumatic Tube Loads Per Day	I14			
Pneumatic Tube Unloads Per Day	I15			
Work Days Per Week	I16A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 3 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Existing Staff Time Per Week	I17A			
RECORD ASSEMBLY AND ANALYSIS:				
Total Yearly Newborns	J1A			
Total Yearly Obstetrics	J2A			
Total Yearly Medical	J3A			
Total Yearly Surgical	J4A			
Workdays Per Year	J5A			
Average Number of Setups Per Day	J6			
Total Pages in 30 Records for Newborns	J7A			
Total Pages in 30 Records for Obstetrics	J8A			
Total Pages in 30 Records for Patient Records	J9A			
Total Pages in 30 Surgical Records	J10A			
Notification Calls Per Day	J11			
Completion Calls Per Day	J12			
Total Weekly Incomplete Records	J13A			
Workdays Per Week	J13B			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 4 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Trips Per Day	J14			
Pickups Per Trip	J15			
Unobstructed Paces Per Trip	J16			
Obstructed Paces Per Trip	J17			
Unobstructed Cart Paces Per Trip	J18			
Obstructed Cart Paces Per Trip	J19			
Cart Start-Stops Per Trip	J20A			
Elevator Rides Per Trip	J21			
Traffic Floors Per Trip	J22			
Floors Per Trip	J23			
Floors Per Trip Up	J24			
Floors Per Trip Down	J25			
Dumbwaiter Trips Per Day	J26			
Loads Per Day	J27			
Unloads Per Day	J28			
Record Processing Separate-Combined	J29A			
No Fastening Simple Handling	J30A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 5 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Staple Once	J31A			
Staple Twice	J32A			
Punch Record and Clip with 2-Prong Clip	J33A			
Paper Clip	J34A			
Call Nursing Station and Inform Them of Deficiencies	J35A			
Call Nursing Station and Get Information	J36A			
Write Patient Name and/or Number and Insert in Folder	J37A			
Exam Work Done by Nurses	J38A			
File Deficient Records in Drawer File	J39A			
File Deficient Records in Open-Shelf File	J39B			
Workdays Per Week	J40A			
Existing Staff Time Per Week	J41A			
TRANSCRIPTION:				
Weeks Total Doctors with Incomplete Records	K1A			
Workdays Per Week	K1B			
Month's Total Incomplete Records	K2A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 6 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Workdays Per Month	K2B			
Doctors Requests Per Day	K3			
Total Monthly Counted Records	K4A			
Workdays Per Month	K4B			
Words Per Doctor in Delinquent Record Report	K5			
Month's Total Delinquent Reports Per Doctor	K6A			
Workdays Per Month	K6B			
Month's Belts or Discs	K7A			
Workdays Per Month	K7B			
Month's Total Reports	K8IA			
Workdays Per Month	K8IB			
Total Pages in 30 Reports	K9IA			
Month's Total Operation Diagnoses	K10IA			
Workdays Per Month	K10IB			
Full Lines in 30 Pages	K11IA			
Partial Lines in 30 Pages	K12IA			
Month's Total Transcribed Reports	K8IIA			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 7 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Workdays Per Month	K8IIB			
Month's Total Batches	K13IIA			
Workdays Per Month	K13IIB			
Year's Total Newborns	K14A			
Workdays Per Year	K14B			
Year's Total Obstetrics	K15A			
Year's Total Medical	K16A			
Year's Total Surgical	K17A			
Trips Per Day	K18			
Pickups Per Trip	K19			
Unobstructed Paces Per Trip	K20			
Obstructed Paces Per Trip	K21			
Unobstructed Cart Paces Per Trip	K22			
Obstructed Cart Paces Per Trip	K23			
Cart Start-Stops Per Trip	K24A			
Elevator Rides Per Trip	K25			
Traffic Floors Per Trip	K26			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 8 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Floors Per Trip	K27			
Floors Per Trip Up	K28			
Floors Per Trip Down	K29			
Dumbwaiter Trips Per Day	K30			
Loads Per Day	K31			
Unloads Per Day	K32			
Transcription Done by MR/Not Done by MR	K33A			
Ordered/Not Ordered	K34A			
MR Placed in Doctor's Box or Pigeonhole	K35A			
MR in Doctor's Drawer File	K35B			
MR Placed in Doctor's Open Shelf File	K35C			
Handwritten Notices or Reports	K36A			
Typed Notices or Reports	K37A			
Distribute to Dr.'s Boxes or Pigeonholes	K37B			
Type Name and Department of Doctor	K37C			
Addressing Card/Envelope with Addressograph	K37D			
Insert Notice in Envelope, Seal and Mail	K37E			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 9 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Belts Used or Discs Used	K38A			
Transcription Done by MR/Not Done by MR	K39A			
Drawer File	K40A			
Open Shelf File	K40B			
File Reports in Patient Charts	K40C			
File in Doctor's Box/Pigeonhole	K40D			
Decrease in Work Load #8	K41A			
Workdays Per Week	K42A			
Existing Staff Time Per Week	K43A			
CODING SETUPS PER DAY				
CODING AND ABSTRACTING:	L1			
Total Yearly Newborns	L2A			
Workdays Per Year	L2B			
Total Yearly Obstetrics	L3A			
Total Yearly Medical	L4A			
Total Yearly Surgical	L5A			
Abstracting Setups Per Day	L7			

FIGURE B5. **Independent Variable Data Collection Input Form**

Hospital: ______________________

Date: ______________________

Initials: ______________________

Sheet: 10 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Total Monthly PAS Batches	L8A			
Workdays Per Month	L8B			
Total Items on 30 Forms	L9A			
Total Yearly Statistical Batches	L10A			
Workdays Per Year	L10B			
Abstracting Done as a Separate Activity	L11A			
Coding by ICDA and Abstracting is One Activity	L11B			
Coding by SNDO	L11C			
ICDA Coding Checked by MR	L12A			
SNDO Coding Checked by MR	L12B			
Abstracting Done on Professional Activity Form/Other Forms	L13A			
Handwritten Abstracts	L14A			
Workdays Per Week	L15A			
Existing Staff Time Per Week	L16A			
INDEXING:				
Indexing Setups Per Day	M1			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 11 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Total New Admissions	M2A			
Workdays Per Year	M2B			
Items Per Card	M3			
Total Yearly Admissions or Discharges	M4A			
Workdays Per Year	M4B			
Updated Items Per Card	M5			
Total Yearly Re-Admissions and Discharges	M6A			
Workdays Per Year	M6B			
Secondary Index Setups Per Day	M7			
Year's Total Discharges	M8IA			
Workdays Per Year	M8IB			
Month's Total Indexed Records	M8IIA			
Workdays Per Month	M8IIB			
Items on 30 Disease Index Cards	M9A			
Items on 30 Operation Index Cards	M10A			
Items on 30 Physician Index Cards	M11A			
Disease Index Cards Per Month	M12A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 12 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Workdays Per Month	M12B			
Operation Index Cards Per Month	M13A			
Workdays Per Month	M13B			
Physician Index Cards Per Month	M14A			
Workdays Per Month	M14B			
Cards Arranged Alphabetically	M15A			
Alphabetical Filing in Drawer File	M15B			
Alphabetical File in Mechanical File	M15C			
Phonetic Filing in Drawer File	M15D			
Phonetic Filing in Mechanical File	M15E			
Alphabetical Filing in Drawer File	M16A			
Alphabetical Filing in Mechanical File	M16B			
Phonetic Filing in Drawer File	M16C			
Phonetic Filing in Mechanical File	M16D			
Alphabetical Filing in Drawer File	M17A			
Alphabetical Filing in Mechanical File	M17B			
Phonetic Filing in Drawer File	M17C			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 13 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Phonetic Filing in Mechanical File	M17D			
Secondary Indices	M18A			
Handwritten Cards	M19A			
Workdays Per Week	M20A			
Existing Staff Time Per Week	M21A			
FILING:				
Filing Setups Per Day	N1			
Year's Total New Admissions	N2A			
Workdays Per Year	N2B			
Records Filed Per Month	N3A			
Discharge/Typical Month	N3B			
Total Discharges Per Year	N3C			
Filing Workdays/Year	N3D			
Re-Admissions Per Year	N4A			
Workdays Per Year	N4B			
Items Per New Admissions Folder	N5			

FIGURE B5. **Independent Variable Data Collection Input Form**

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 14 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Items Per Admissions Summary for Readmitted Patients	N6			
Patient Identification Handwritten on Folder	N7A			
Patient Identification Typed on Folder	N7B			
Patient Identification Stamped on Folder	N7C			
Inserted - Fastened with Clip/Not Fastened with Clip	N8A			
Ordered Serial/Ordered Terminal	N9A			
Serial Filing - Open Shelf File	N10A			
Serial Filing - Drawer Shelf File	N10B			
Terminal Digit Filing - Open Shelf File	N10C			
Terminal Digit Filing - Drawer Shelf File	N10D			
Mechanical Filing	N10E			
Value for #523	N11A			
Patient Readmission - New Number or Old Number	N12A			
Record Retrieved from Drawer File	N13A			
Record Retrieved from Open Shelf File	N13B			
Record Retrieved from Mechanical File	N13C			
Value for #517	N14A			

FIGURE B5. **Independent Variable Data Collection Input Form**

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 15 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Readmission - Old Folder or New Folder	N15A			
Readmission - Handwritten or Typed	N16A			
Readmission - Handwritten or Typed	N17A			
Filing in Drawer File	N18A			
Filing in Open Shelf File	N18B			
Filing in Mechanical File	N18C			
Summary - Handwritten or Typed	N19A			
Workdays Per Week	N20A			
Existing Staff Time Per Week	N21A			
RETRIEVAL:				
Records Retrieved in a Typical Month	O1A			
Workdays in a Typical Month	O1B			
Total Number of Transfers	O2A			
Outguides Removed Per Day	O3			
Serial Filing - Drawer File	O4A			
Serial Filing - Open Shelf File	O4B			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________________

Date: ____________________

Initials: ____________________

Sheet: 16 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Serial Filing - Mechanical File	04C			
Terminal Digit Filing - Drawer File	04D			
Terminal Digit Filing - Open Shelf File	04E			
Value for NT #604	05A			
Outguides - Handwritten or Typed	06A			
Clipcard to Record, Retrieved and Set Aside	07A			
Remove Clip, Separate Card and Record	07B			
Handwrite Control Card or Log Entries	07C			
Arrange Called Out Cards Alpha or Number	07D			
File Control Cards	07E			
Update Control Cards	07F			
Locate Entries and Cards Off	07G			
Workdays Per Week	08A			
Existing Staff Time Per Week	09A			
STATISTICAL:				
Statistical Report Setups Per Day	P1			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 17 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Total Monthly Report Forms	P2A			
Workdays Per Month	P2B			
Total Copied Items in 50 Reports	P3A			
Total Monthly Records Reported	P4A			
Workdays Per Month	P4B			
Total Yearly Newborns	P5A			
Workdays Per Year	P5B			
Certificate Calls Per Day	P6			
Trips Per Day	P7			
Unobstructed Paces Per Trip	P8			
Obstructed Paces Per Trip	P9			
Pickups Per Trip	P10			
Elevator Rides Per Trip	P11			
Traffic Floors Per Trip	P12			
Floors Per Trip	P13			
Floors Per Trip Up	P14			
Floors Per Trip Down	P15			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 18 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Dumbwaiter Trips Per Day	P16			
Loads Per Day	P17			
Unloads Per Day	P18			
Data - Typed or Handwritten	P19A			
Performed by MR - Prepare Newborn List	P20A			
Performed by MR - Interview Mother	P20B			
Performed by MR - Interview Mother	P20C			
Performed by MR - Obtain Mother's Signature	P20D			
Performed by MR - Type Birth Certificates	P20E			
Performed by MR - Type Address	P20F			
Performed by MR - Assemble and Insert Certificate	P20G			
Performed by MR - Alphabetize for Filing	P20H			
Performed by MR - File in Doctor's Boxes	P20I			
Performed by MR - File in Mother's MR	P20J			
Performed by MR - Arrange Worksheets	P20K			
Workdays Per Week	P21A			
Existing Staff Time Per Week	P22A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 19 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
PHONE:				
Calls to Staff Per Day	Q1			
Unrecorded Calls Per Day	Q2			
Recorded Calls Per Day	Q3			
Reference Calls Per Day	Q4			
Returned Calls Per Day	Q5			
Calls to Doctors Per Day	Q6			
Calls to Nurses Per Day	Q7			
Workdays Per Week	Q8A			
Existing Staff Time Per Week	Q9A			
CORRESPONDENCE:				
Correspondence Setups Per Day	R1			
Total Monthly Request Letters	R2A			
Workdays Per Month	R2B			
Items Per Month	R3			
Total Monthly Deficient Requests	R4A			

FIGURE B5. Independent Variable Data Collection Input Form

Hospital: ____________

Date: ____________

Initials: ____________

Sheet: 20 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Workdays Per Month	R4B			
Words Per Authorization	R5			
Total Pages Copied for 30 Reports	R6A			
Total Weekly In-Person Requests	R7A			
Workdays in a Typical Week	R7B			
Handwritten or Typed	R8A			
Form Letter or Not	R9A			
Handwritten or Typed	R10A			
Serial Filing	R11A			
Terminal Digit Filing	R11B			
Mechanical File	R11C			
Open Shelf or Drawer	R12A			
Value for NT #918	R13A			
Typed or Handwritten	R14A			
Xerox Copies Made	R15A			
Thermofax Copies made	R15B			
SCM Copies Made	R15C			

FIGURE B5. **Independent Variable Data Collection Input Form**

Hospital: ____________________

Date: ____________________

Initials: ____________________

Sheet: 21 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Handwritten or Typed	R16A			
Handwritten or Typed	R17A			
Handwritten Serial Filing	R18A			
Terminal Filing	R18B			
Mechanical Filing	R18C			
Open Shelf or Drawer	R19A			
Value for NT #940	R20A			
Workdays Per Week	R21A			
Existing Staff Time Per Week	R22A			
OUTPATIENT:				
Outpatient Setups Per Day	S1			
Total Yearly Outpatients	S2A			
Outpatient Record Workdays Per Year	S2B			
Total Monthly Deficient Records	S3A			
Workdays Per Month	S3B			
Serial Filing	S4A			

FIGURE B5. **Independent Variable Data Collection Input Form**

Hospital: ______________

Date: ______________

Initials: ______________

Sheet: 22 of 22

Computer Variable Description	Computer Variable Designation	0 Value	1 Value	Other Value
Terminal Digit Filing	S4B			
Mechanical File	S4C			
Open Shelf or Drawer	S5A			
Value for NT #1007	S6A			
Workdays Per Month	S7A			
Existing Staff Time Per Week	S8A			
EMERGENCY:				
Emergency Room Setups Per Day	T1			
Total Yearly Emergencies	T2A			
Workdays Per Year	T2B			
Serial Filing	T3A			
Terminal Digit Filing	T3B			
Mechanical Filing	T3C			
Open Shelf or Drawer	T4A			
Value for NT #1107	T5A			
Workdays Per Week	T6A			
Existing Staff Time Per Week	T7A			

APPENDIX B

SECTION 6

COMPUTER INPUT FORMS

PROGRAM TITLE ______ ☐ VERIFY CHAR. SET 026 ☐ 029 ☐ OTHER ☐ ______

NAME ______ CHARGE OR REFERENCE NUMBER ______ DATE ______

TØ1A					
ØR1	ØR2	ØR3			
FP1	FP2	FP3	FP4	FP5	FP6
FP7	FP8	FP9	FP10	FP11	FP12
I1	I2	I3	I4	I5	I6
I7A	I8	I9	I10	I11	I12
I13	I14	I15	I16A	I17A	
J1A	J2A	J3A	J4A	J5A	J6
J7A	J8A	J9A	J10A	J11	J12
J13A	J13B	J14	J15	J16	J17

PROGRAM TITLE ______ ☐ VERIFY CHAR. SET 026 ☐ 029 ☐ OTHER ☐ ______

NAME ______ CHARGE OR REFERENCE NUMBER ______ DATE ______

J18	J19	J20A	J21	J22	J23
J24	J25	J26	J27	J28	J29A
J30A	J31A	J32A	J33A	J34A	J35A
J36A	J37A	J38A	J39A	J39B	J40A
J41A					
K1A	K1B	K2A	K2B	K3	K4A
K4B	K5	K6A	K6B	K7A	K7B
K8IA	K8IB	K9IA	K10IA	K10IB	K11IA
K12IA	K8IIA	K8IIB	K13IIA	K13IIB	K14A
K14B	K15A	K16A	K17A	K18	K19

PROGRAM TITLE: ______ ☐ VERIFY CHAR. SET 026 ☐ 029 ☐ OTHER ☐ ______

NAME ______ CHARGE OR REFERENCE NUMBER ______ DATE ______

K20	K21	K22	K23	K24A	K25
K26	K27	K28	K29	K30	K31
K32	K33A	K34A	K35A	K35B	K35C
K36A	K37A	K37B	K37C	K37D	K37E
K38A	K39A	K40A	K40B	K40C	K40D
K41A	K42A	K43A			
L1	L2A	L2B	L3A	L4A	L5A
L7	L8A	L8B	L9A	L10A	L10B
L11A	L11B	L11C	L12A	L12B	L13A
L14A	L15A	L16A			

PROGRAM TITLE: ______ ☐ VERIFY

CHAR. SET
026 ☐ 029 ☐ OTHER ☐ ______

NAME ______ CHARGE OR REFERENCE NUMBER ______ DATE ______

M1	M2A	M2B	M3	M4A	M4B
M5	M6A	M6B	M7	M8IA	M8IB
M8IIA	M8IIB	M9A	M10A	M11A	M12A
M12B	M13A	M13B	M14A	M14B	M15A
M15B	M15C	M15D	M15E	M16A	M16B
M16C	M16D	M17A	M17B	M17C	M17D
M18A	M19A	M20A	M21A		
N1	N2A	N2B	N3A	N3B	N3C
N3D	N4A	N4B	N5	N6	N7A
N7B	N7C	N8A	N9A	N10A	N10B

PROGRAM TITLE ☐ VERIFY CHAR. SET 026 ☐ 029 ☐ OTHER ☐

NAME CHARGE OR REFERENCE NUMBER DATE

N10C	N10D	N10E	N11A	N12A	N13A	
N13B	N13C	N14A	N15A	N16A	N17A	
N18A	N18B	N18C	N19A	N20A	N21A	
Ø1A	Ø1B	Ø2A	Ø3	Ø4A	Ø4B	
Ø4C	Ø4D	Ø4E	Ø5A	Ø6A	Ø7A	
Ø7B	Ø7C	Ø7D	Ø7E	Ø7F	Ø7G	
Ø8A	Ø9A					
P1	P2A	P2B	P3A	P4A	P4B	
P5A	P5B	P6	P7	P8	P9	
P10	P11	P12	P13	P14	P15	

PROGRAM TITLE ☐ VERIFY

CHAR. SET 026 ☐ 023 ☐ OTHER ☐

NAME CHARGE OR REFERENCE NUMBER DATE

P16	P17	P18	P19A	P20A	P20B
P20C	P20D	P20E	P20F	P20G	P20H
P20I	P20J	P20K	P21A	P22A	
Q1	Q2	Q3	Q4	Q5	Q6
Q7	Q8A	Q9A			
R1	R2A	R2B	R3	R4A	R4B
R5	R6A	R7A	R7B	R8A	R9A
R10A	R11A	R11B	R11C	R12A	R13A
R14A	R15A	R15B	R15C	R16A	R17A
R18A	R18B	R18C	R19A	R20A	R21A

PROGRAM TITLE: ______ ☐ VERIFY　　CHAR. SET. 026 ☐ 029 ☐ OTHER ☐ ______

NAME ______ CHARGE OR REFERENCE NUMBER ______ DATE ______

R22A					
S1	S2A	S2B	S3A	S3B	S4A
S4B	S4C	S5A	S6A	S7A	S8A
T1	T2A	T2B	T3A	T3B	T3C
T4A	T5A	T6A	T7A		

APPENDIX B

SECTION 7

SAMPLE COMPUTER OUTPUT

RECORD PICKUP

	MAN MINUTES PER DAY
WALKING TIME	4.04
PUSHING CART	.00
PICKUP AND SIGN FOR RECORDS	.65
TAKING ELEVATOR	4.62
STAIRWAY TRAVEL	.00
PICKUP RECORDS FROM DUMBWAITER	.00
TRANSPORT RECORDS THROUGH PNEUMATIC TUBE	.00
TOTAL TIME FOR RECORD PICKUP	9.31

RECORD ASSEMBLY AND ANALYSIS

	MAN MINUTES PER DAY
PREPARE RECORDS FOR ASSEMBLY AND ANALYSIS	5.40
ASSEMBLY AND ANALYSIS - SEPARATE METHOD	.00
ASSEMBLY AND ANALYSIS - COMBINED METHOD	109.68
COMPLETE RECORDS LEFT INCOMPLETE BY NURSES	.05
TRANSPORTATION DURING ASSEMBLY AND ANALYSIS	1.30
TOTAL TIME FOR RECORD ASSEMBLY AND ANALYSIS	116.43

TRANSCRIPTION

	MAN MINUTES PER DAY
SORT AND DISTRIBUTE INCOMPLETE RECORDS	.00
ASSIST AND PREPARE DOCTORS REPORTS	1.54
DISTRIBUTE NOTES TO DOCTORS	.13
PREPARE BELTS OR DISCS FOR TRANSCRIPTIONS	2.15
TRANSCRIPTION	644.70
SORT AND FILE TYPED REPORTS	.00
FINAL COMPLETION CHECK OF RECORD	15.99
TRANSPORTATION DURING TRANSCRIPTION ACTIVITIES	46.03
TOTAL TIME FOR TRANSCRIPTION	710.54

CODING AND ABSTRACTING

	MAN MINUTES PER DAY
SETUP AND CLEANUP FOR CODING	1.52
CODING	25.90
CHECK CODING WITH WRITTEN DIAGNOSIS	.00
SETUP FOR ABSTRACTING	2.10
ABSTRACTING	3.76
CHECKING STATISTICAL REPORTS FOR COMPLETION	.04
TOTAL TIME FOR CODING AND ABSTRACTING	33.33

INDEXING

	MAN MINUTES PER DAY
SETUP FOR MASTER PATIENT FILE INDEXING	1.04
TYPE CARDS FOR NEW ADMISSIONS	10.07
FILE NEW ADMISSIONS	.00
UPDATE MASTER PATIENT INDEX FOR DISCHARGES/READMISSIONS	29.68
IN-HOUSE FILING AND RETRIEVING - MASTER PATIENT INDEX	9.66
MAINTENANCE OF SECONDARY INDICES	14.39
TOTAL TIME FOR INDEXING	69.83

NUMBERING AND FILING OF RECORDS

	MAN MINUTES PER DAY
SETUP FOR FILING	2.10
PREPARE RECORD FOLDERS FOR NEW ADMISSIONS	2.85
INSERT RECORD IN FOLDER AND FILE	19.29
UPDATE RECORD FOLDERS FOR READMISSIONS	.00
TOTAL TIME FOR NUMBERING AND FILING	24.25

RETRIEVAL AND RECORD LOCATION CONTROL

	MAN MINUTES PER DAY
FIND AND RETRIEVE RECORDS FROM FILE	13.01
REPLACE RECORDS RETRIEVED WITH AN OUTGUIDE	8.90
MAINTAIN CONTROL CARD FILE OR LOG FOR OUT RECORDS	15.54
TOTAL TIME FOR RETRIEVAL AND RECORD LOCATION CONTROL	37.44

PREPARING STATISTICAL REPORTS AND BIRTH CERTIFICATES

	MAN MINUTES PER DAY
SETUP FOR STATISTICAL REPORTS	2.10
COPY DATA FROM RECORDS AND FILE COMPLETED REPORTS	43.61
PREPARE BIRTH CERTIFICATES	.00
TRANSPORTATION TO PREPARE REPORTS OR CERTIFICATES	.00
TOTAL TIME FOR REPORTS AND CERTIFICATES	45.71

INCOMING AND OUTGOING PHONE CALLS FOR MISSING RECORDS

	MAN MINUTES PER DAY
ANSWER INCOMING PHONE CALLS	20.31
MAKE OUTGOING PHONE CALLS	1.64
TOTAL TIME FOR PHONE CALLS	21.96

CORRESPONDENCE AND IN-PERSON INFORMATION REQUESTS

	MAN MINUTES PER DAY
SETUP AND CLEANUP FOR CORRESPONDENCE	1.03
COPY AND VERIFY A REQUEST FOR MEDICAL RECORDS INFO.	7.38
ANSWER VERIFIED REQUESTS	11.57
IN-PERSON REQUESTS	2.49
TOTAL TIME FOR CORRESPONDENCE AND IN-PERSON INFO. REQ.	22.46

OUT-PATIENT RECORDS

	MAN MINUTES PER DAY
SETUP FOR OUT-PATIENT RECORDS	.00
PROCESS OUT-PATIENT RECORDS	.00
TOTAL TIME FOR OUT-PATIENT RECORDS	.00

EMERGENCY ROOM RECORDS

	MAN MINUTES PER DAY
SETUP TO PROCESS EMERGENCY ROOM REPORTS	2.10
ASSEMBLE,ANALYZE, AND FILE EMERGENCY ROOM RECORDS	3.96
TOTAL TIME FOR EMERGENCY ROOM RECORDS	6.06

STANDARD STAFF TIME, EXISTING STAFF TIME, AND DIFFERENCES BY AREA

	MAN HOURS PER WEEK
TOTAL STANDARD STAFF TIME RECORD PICKUP	.91
EXISTING STAFF TIME FOR RECORD PICKUP	1.00
EXISTING - STD. STAFF TIME FOR RECORD PICKUP	-.09
TOTAL STANDARD STAFF TIME FOR ASSEMBLY AND ANALYSIS	11.35
EXISTING STAFF TIME FOR ASSEMBLY AND ANALYSIS	19.00
EXISTING - STD. STAFF TIME FOR ASSEMBLY AND ANALYSIS	-7.65
TOTAL STANDARD STAFF TIME FOR TRANSCRIPTION	69.61
EXISTING STAFF TIME FOR TRANSCRIPTION	112.50
EXISTING - STD. STAFF TIME FOR TRANSCRIPTION	-42.89
TOTAL STANDARD STAFF TIME FOR CODING AND ABSTRACTING	3.25
EXISTING STAFF TIME FOR CODING AND ABSTRACTING	15.00
EXISTING - STD. STAFF TIME FOR CODING AND ABSTRACTING	-11.75
TOTAL STANDARD STAFF TIME FOR INDEXING	6.81
EXISTING STAFF TIME FOR INDEXING	7.50
EXISTING - STD. STAFF TIME FOR INDEXING	-.69
TOTAL STANDARD STAFF TIME FOR NUMBERING AND FILING	2.36
EXISTING STAFF TIME FOR NUMBERING AND FILING	6.50
EXISTING - STD. STAFF TIME FOR NUMBERING AND FILING	-4.14
TOTAL STANDARD STAFF TIME FOR RETRIEVAL AND CONTROL	3.65
EXISTING STAFF TIME FOR RETRIEVAL AND CONTROL	2.50
EXISTING - STD. STAFF TIME FOR RETRIEVAL AND CONTROL	1.15

TOTAL STANDARD STAFF TIME FOR REPORTS AND CERTIFICATES	4.46
EXISTING STAFF TIME FOR REPORTS AND CERTIFICATES	7.50
EXISTING - STD. STAFF TIME FOR REPORTS AND CERTIFICATES	-3.04
TOTAL STANDARD STAFF TIME FOR PHONE CALLS	2.14
EXISTING STAFF TIME FOR PHONE CALLS	2.00
EXISTING - STD. STAFF TIME FOR PHONE CALLS	.14
TOTAL STANDARD STAFF TIME FOR CORR./IN-PER. INFO. REQ.	2.19
EXISTING STAFF TIME FOR CORR./IN-PER. INFO. REQ.	5.00
EXISTING - STD. STAFF TIME FOR CORR./IN-PER. INFO. REQ.	-2.81
TOTAL STANDARD STAFF TIME FOR OUT-PATIENT RECORDS	.00
EXISTING STAFF TIME FOR OUT-PATIENT RECORDS	.00
EXISTING - STD. STAFF TIME FOR OUT-PATIENT RECORDS	.00
TOTAL STANDARD STAFF TIME FOR EMERGENCY ROOM RECORDS	.59
EXISTING STAFF TIME FOR EMERGENCY ROOM RECORDS	1.00
EXISTING - STD. STAFF TIME FOR EMERGENCY ROOM RECORDS	-.41

TOTAL MEDICAL RECORDS STAFFING

	MAN HOURS PER WEEK
TOTAL STANDARD STAFF TIME	107.32
TOTAL EXISTING STAFF TIME	179.50
EXISTING - STD. STAFF TIME FOR TOTALS	72.18

APPENDIX C

Appendix to Chapter 5

SECTION 1

COMPUTER PROGRAM IN FORTRAN IV

FOR USE ON UNITED COMPUTER SYSTEMS'

TIME-SHARED SERVICES

```
LIST,N,001

      PROGRAM OBS2(INPUT,OUTPUT,TAPE2)
      NX=02500
      REAL NND1,NND2,NND3,NND4,NND5
      REAL NDS,NDD1,NDD2,NDD3,NDD4,NDD5
      DATA TND,TNN.TNA.TNC,TNS/5*0.0/
      DATA NP1,NP2,NP3,NP4,NP5,NP6,NP7,NP8/8*0/
      DATA TTD,TTN.TTA,TTC,TTS/5*0.0/
      DATA NDD1,NDD2,NDD3,NDD4,NDD5/5*0.0/
      DATA NND1,NND2,NND3,NND4,NND5/5*0.0/
      DATA TTNR1,TTNR2,TTNR3,TTNR4,TTNR5,TTNR6,TTNR7,TTNR8/8*0.0/
       DATA TTDR1,TTDR2,TTDR3,TTDR4,TTDR5,TTDR6,TTDR7,TTDR8/8*0.0/
      READ(2,) LINE,NID,NHN,NDW,NSD,NUN,NDT,NL
390   IF(NX-LINE) 350,350,370
370   READ(2,) LINE,NC,NTD,DUR,NP,ND,NR
      GO TO 390
350   READ(2,) LINE,NID,NHN,NDW,NSD,NUN,NDT,NL
      N=NL
      DO 100 I=1,N
      READ(2,) LINE,NC,NTD,DUR,NP,ND,NR
      P=NP
      IF(P-1.) 2,2,1
1     IF(P-2.)4,4,3
3     IF(P-3.)6,6,5
5     IF(P-4.)8,8,7
7     GO TO 10
2     TTD=TTD+DUR
      TND=TND+1.
      GO TO (20,30,40,50,60),ND
20    NDD1=NDD1+1
      GO TO 80
30    NDD2=NDD2+1
      GO TO 80
40    NDD3=NDD3+1
      GO TO 80
50    NDD4=NDD4+1
      GO TO 80
60    NDD5=NDD5+1
80    CONTINUE
       GO TO (25,35,45,55,65,75,85,95),NR
25    TTDR1=TTDR1+1.
      GO TO 105
35    TTDR2=TTDR2+1.
```

```
      GO TO 105
45    TTDR3=TTDR3+1.
      GO TO 105
55    TTDR4=TTDR4+1.
      GO TO 105
65    TTDR5=TTDR5+1.
      GO TO 105
75    TTDR6=TTDR6+1.
      GO TO 105
85    TTDR7=TTDR7+1.
      GO TO 105
95    TTDR8=TTDR8+1.
105   GO TO 12
4     TTN=TTN+DUR
      TNN=TNN+1.
      GO TO (21,31,41,51,61),ND
21    NND1=NND1+1.
      GO TO 90
31    NND2=NND2+1.
      GO TO 90
41    NND3=NND3+1.
      GO TO 90
51    NND4=NND4+1.
      GO TO 90
61    NND5=NND5+1.
90    CONTINUE
      GO TO (26,36.46,56,66,76,86,96),NR
26    TTNR1=TTNR1+1.
      GO TO 106
36    TTNR2=TTNR2+1.
      GO TO 106
46    TTNR3=TTNR3+1.
      GO TO 106
56    TTNR4=TTNR4+1.
      GO TO 106
66    TTNR5=TTNR5+1.
      GO TO 106
76    TTNR5=TTNR6+1.
      GO TO 106
86    TTNR7=TTNR7+1.
      GO TO 106
96    TTNR8=TTNR8+1.
106   CONTINUE
      GO TO 12
6     TTA=TTA+DUR
      TNA=TNA+1.
      GO TO 12
8     TTC=TTC+DUR
      TNC=TNC+1.
      GO TO 12
```

```
10    TTS=TTS+DUR
      TNS=TNS+1.
12    CONTINUE
      IF(NTD-80) 400,410,410
400   NP1=NP1+1
      GO TO 100
410   IF(NTD-90) 420,430,430
420   NP2=NP2+1
      GO TO 100
430   IF(NTD-100) 440,450,450
440   NP3=NP3+1
      GO TO 100
450   IF(NTD-110) 460,470,470
460   NP4=NP4+1
      GO TO 100
470   IF(NTD-120) 480,490,490
480   NP5=NP5+1
      GO TO 100
490   IF(NTD-130) 500,510,510
500   NP6=NP6+1
      GO TO 100
510   IF(NTD-140) 520,530,530
520   NP7=NP7+1
      GO TO 100
530   NP8=NP8+1
100   CONTINUE
      NDS=NL
      PTND=TND/NDS*100.
      PTNN=TNN/NDS*100.
      PTNA=TNA/NDS*100.
      PTNC=TNC/NDS*100.
      PTNS=TNS/NDS*100.
      XNP1=NP1
      XNP2=NP2
      XNP3=NP3
      XNP4=NP4
      XNP5=NP5
      XNP6=NP6
      XNP7=NP7
      XNP8=NP8
      PNP1=XNP1/NDS*100.
      PNP2=XNP2/NDS*100.
      PNP3=XNP3/NDS*100.
      PNP4=XNP4/NDS*100.
      PNP5=XNP5/NDS*100.
      PNP6=XNP6/NDS*100.
      PNP7=XNP7/NDS*100.
      PNP8=XNP8/NDS*100.
      ATD=TTD/TND
      ATN=TTN/TTN
```

```
      ATA=TTA/TNA
      ATC=TTC/TNC
      ATS=TTS/TNS
      NDS=NL
      PDD1=NDD1/TND*100.
      PDD2=NDD2/TND*100.
      PDD3=NDD3/TND*100.
      PDD4=NDD4/TND*100.
      PDD5=NDD5/TND*100.
      PND1=NND1/TNN*100.
      PND2=NND2/TNN*100.
      PND3=NND3/TNN*100.
      PND4=NND4/TNN*100.
      PND5=NND5/TNN*100.
      PRINT 200
  200 FORMAT(48X,*OBSERVATION DATA ANALYSIS REPORTS*//////////)
      PRINT 205
  205 FORMAT(*ID NR      HOSP NR      DAY OF WEEK      SHIFT      NRSG UNIT
+      DATE      NR DATA SETS*/)
      PRINT 206,NID,NHN,NDW,NSD,NUN,NDT,NL
      PRINT210
      PRINT215
215   FORMAT(* DOCTOR  NURSE  AIDE  CLERK   STUDENT*/)
       PRINT 220,TND,TNN,TNA,TNC,TNS,PTND,PTNN.PTNA;PTNC,PTNS
220   FORMAT(F6.0,3F7.0,F8.0/F6.2,3F7.2,F8.2)
      PRINT 225
  225 FORMAT(/////,45X,*NR AND PERCENT PULLED BY DOCTOR BY DEST*/)
  206 FORMAT(I5,I12,I16,I10,I14,I13,I8)
  210 FORMAT(/////,45X,*NUMBER AND PERCENT RECORDS PULLED BY PERSON*/)
      PRINT 230
230   FORMAT(*NS CHART      NS ROOM      PAT ROOM    OFF FLR  UNKNOWN*/)
      PRINT 216,NDD1,NDD2,NDD3,NDD4,NDD5,PDD1,PDD2,PDD3,PDD4,PDD5
  216 FORMAT(5F10.0/5F10.2)
      PRINT 290
  290 FORMAT(/////,45X,*NR AND PERCENT PULLED BY NURSE BY DEST*/)
      PRINT 230
      PRINT 300,NND1,NND2,NND3,NND4,NND5,PND1,PND2,PND3,PND4.PND5
  300 FORMAT(5F10.0/5F10.2)
      PRINT240
  240 FORMAT(//////////45X,*AVERAGE TIME PER RECORD BY PERSON*/)
      PRINT 215
      PRINT 226,ATD,ATN,ATA,ATC,ATS
226   FORMAT(F6.2,4F7)
      PRINT 250
  250 FORMAT(//////////45X,*NUMBER RECORDS PULLED BY DOCTOR BY REASON*/)
      PRINT255
  255 FORMAT(*READ&WRITE      WRITE      READ      INPUT      EXTRACT  INP&E
+             I&R&W      OTHER*/)
```

```
      PRINT 260.TTDR1,TTDR2,TTDR3,TTDR4,TTDR5,TTDR6,TTDR7,TTDR8
  260 FORMAT(8F10.0)
      PRINT270
270   FORMAT(//////////,45X,*NUMBER RECORDS PULLED BY NURSE BY REASON*/)
      PRINT 255
      PRINT 280,TTNR1,TTNR2,TTNR3,TTNR4,TTNR5,TTNR6,TTNR7,TTNR8
280   FORMAT(8F10.0)
      PRINT 600, NP1,NP2.NP3.NP4,NP5,NP6,NP7,NP8,
+      PNP1,PNP2,PNP3,PNP4,PNP5,PNP6,PNP7,PNP8
600 FORMAT(/////45X,*NR AND PERCENT PULLED BY HOUR OF SHIFT*//
+     8I15/8F15.2)
      END
RUN COMPLETE.
```

[illegible] L [illegible] 0.[illegible].32.

SECTION 2

OBSERVATION DATA ANALYSIS AS PUT
OUT BY THE OBSERVATION PROGRAM

ID NR	HOSP NR	DAY OF WEEK	SHIFT	NRSG UNIT	DATE	NR DATA SETS
1	1	3	1	1	1110	293

NUMBER AND PERCENT RECORDS PULLED BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
87	114	38	6	48
29.69	38.91	12.97	2.05	16.38

NR AND PERCENT PULLED BY DOCTOR BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
65	0	21	0	1
74.71	0	24.14	0.	1.15

NR AND PERCENT PULLED BY NURSE BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
114	0	0	0	0
100.00	0	0.	0.	0.

NUMBER RECORDS PULLED BY DOCTOR BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
39	22	19	0	4	0	2	1

NUMBER RECORDS PULLED BY NURSE BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
6	69	24	4	7	0	1	3

NR AND PERCENT PULLED BY HOUR OF SHIFT

53	58	32	30	23	0	37	60
18.09	19.80	10.92	10.24	7.85	0.	12.63	20.48

END.

3.557 / 2.109 / 166

ID NR	HOSP NR	DAY OF WEEK	SHIFT	NRSG UNIT	DATE	NR DATA SETS
2	1	3	1	2	1110	410

NUMBER AND PERCENT RECORDS PULLED BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
67	230	12	28	73
16.34	56.10	2.93	6.83	17.80

NR AND PERCENT PULLED BY DOCTOR BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
61	1	4	1	0
91.04	1.49	5.97	1.49	0.

NR AND PERCENT PULLED BY NURSE BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
229	0	0	1	0
99.57	0.	0.	.43	0.

AVERAGE TIME PER RECORD BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NUMBER RECORDS PULLED BY DOCTOR BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E		I&R&W	OTHER
14	32	10	10	0	0	0	1	

NUMBER RECORDS PULLED BY NURSE BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E		I&R&W	OTHER
16	143	54	5	8	0	2	2	

NR AND PERCENT PULLED BY HOUR OF SHIFT

65	57	56	55	34	0	41	102
15.85	13.90	13.66	13.41	8.29	0.	10.00	24.88

END.
CPU SECONDS 4.607

OBSERVATION DATA ANALYSIS REPORTS

ID NR	HOSP NR	DAY OF WEEK	SHIFT	NRSG UNIT	DATE	NR DATA SETS
3	1	4	1	1	1111	333

NUMBER AND PERCENT RECORDS PULLED BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
68	97	60	42	66
20.42	29.13	18.02	12.61	19.82

NR AND PERCENT PULLED BY DOCTOR BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
40	11	17	0	0
58.82	16.18	25.00	0.	0.

NR AND PERCENT PULLED BY NURSE BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
95	0	2	0	0
97.94	0.	2.06	0.	0.

AVERAGE TIME PER RECORD BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
15.05	1	3	7	8

NUMBER RECORDS PULLED BY DOCTOR BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
45	1	21	1	0	0	0	0

NUMBER RECORDS PULLED BY NURSE BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
20	64	13	0	0	0	0	0

NR AND PERCENT PULLED BY HOUR OF SHIFT

51	52	50	21	54	0	39	66
15.32	15.62	15.02	6.31	16.22	0.	11.71	19.82

END.
CPU SECONDS 5.310

ID NR	HOSP NR	DAY OF WEEK	SHIFT	NRSG UNIT	DATE	NR DATA SETS
18	1	3	2	2	1124	115

NUMBER AND PERCENT RECORDS PULLED BY PERSON

DOCTOR	NURSE	AIDE	CLERK	STUDENT
18	31	14	19	33
15.65	26.96	12.17	16.52	28.70

NR AND PERCENT PULLED BY DOCTOR BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
15	3	0	0	0
83.33	16.67	0.	0.	0.

NR AND PERCENT PULLED BY NURSE BY DEST

NS CHART	NS ROOM	PAT ROOM	OFF FLR	UNKNOWN
31	0	0	0	0
100.00	0.	0.	0.	0.

AVERAGE TIME PER RECORD BY PERSON

[illegible]

NUMBER RECORDS PULLED BY DOCTOR BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
13	5	0	0	0	0	0	0

NUMBER RECORDS PULLED BY NURSE BY REASON

READ&WRITE	WRITE	READ	INPUT	EXTRACT	INP&E	I&R&W	OTHER
5	15	10	1	0	0	0	0

NR AND PERCENT PULLED BY HOUR OF SHIFT

0	0	0	0	0	0	0	115
0.	0.	0.	0.	0.	0.	0.	100.00

END.
8.581 / 32.190 / 578